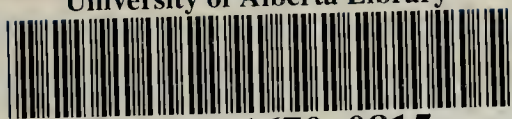


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BLUE JAY

September 1980



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Cover: *White-tailed Ptarmigan*. Wayne Lynch

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THE BIRDS AND BIRDERS OF BEAVERHILLS LAKE.

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Bob Howard

ELIZABETH CRUICKSHANK RECEIVES HONORARY DEGREE

MARGARET BELCHER, 2601 Winnipeg Street, Regina, Saskatchewan,
S4P 1H8.

EDITOR'S NOTE: On 23 May 1980, Elizabeth Cruickshank, Honorary President of the Saskatchewan Natural History Society was presented the degree of Doctor of Laws *honoris causa* at the Spring Convocation of the University of Regina. Most readers of the *Blue Jay* will know Mrs. Cruickshank only as a naturalist, and because Margaret Belcher's citation outlines other areas of her busy life, we are pleased to reprint the citation in its entirety.

Eminent Chancellor, it is my privilege, on behalf of the University Council and Senate, to present to you ELIZABETH ROLEY CRUICKSHANK, MBE.

In January 1916, a vibrant young teacher from New Brunswick arrived in Regina. Facing our proverbial 50-below-zero weather in a suit and button boots, Elizabeth Keirstead did not think she would like Saskatchewan. Yet she stayed to teach in the city, married W. K. Cruickshank of Andrews and Cruickshank, analytical chemists, and in 1980 (64 years later) celebrates Saskatchewan with us at this Convocation.

Very many of you in this audience know Elizabeth Cruickshank as "Liz Roley" of the Regina *Leader Post*. Her "Nature Notes" have appeared weekly for 25 years, and a selection of them was published in book form (in 1976) under the title *A Second Look*. For a number of years Mrs. Cruickshank also wrote nature scripts for the CBC's school broadcasts and spoke to hundreds of visitors to the

Saskatchewan Museum of Natural History, where she manned the information desk and the Blue Jay Bookshop. Always, young people have sought her out and have been stimulated by her enthusiasm. She has been an active member and executive officer of both the Regina and Saskatchewan Natural History Societies, and is now Honorary President of the latter. In 1968, she received the provincial society's Conservation Award.

In all her activities as a naturalist, Elizabeth Cruickshank's mission has been to inculcate the habit of "a second look", to teach us

To see a world in a grain of sand,
And a heaven in a wild flower.

Many and impressive are the contributions that Elizabeth Cruickshank has made to the "quality of life" in this city and province. Particularly in the depressed years of the 1930's and during the Second World War, her warm and courageous acts of service rallied the spirits of a beleaguered society. She was a member of the Regina Welfare Bureau and the Regina Relief Board, and used her free time to run a sewing room where women made quilts and clothes for people on relief. She was President of the Regina Council of Women (which in 1975 made her a life member), and Vice-President of the Community Chest. She served on the executive of the Children's Aid Society and worked with cases before the juvenile courts. She organized the Grace Haven Auxiliary to the Salvation Army, and later



Elizabeth Cruickshank with Cliff Shaw.

served on a C.N.I.B. committee and on the Saskatchewan Social Services Council.

During the war years, Elizabeth Cruickshank was chairman of women's activities for the Saskatchewan section of the National War Finance Committee. She organized more than 400 women's committees, travelling throughout Saskatchewan. On the Dependents' Board of Trustees, she dealt with problems faced by wives of service men overseas. As President of the Provincial Council of Women, she was the one woman member of the Reconstruction Council chaired by Dean Cronkite advising the government on the rehabilitation of returned men. For this extensive

volunteer war work, she was awarded the Order of the British Empire.

Elizabeth Cruickshank is still today a leader in her church, and a popular guest speaker. She is a charter member of the Regina branch of the Canadian Women's Press Club (now the Media Club), and was one of 12 journalists selected to receive the 1967 Centennial Medal.

The granting of an honorary degree is a traditional University ceremony honouring distinguished citizenship. Therefore, Eminent Chancellor, on behalf of the Council and Senate of the University of Regina, I present to you **ELIZABETH ROLEY CRUICKSHANK**, and ask that you confer on her the degree of Doctor of Laws *honoris causa*.

PLANT FINDS FROM SASKATCHEWAN IN 1978 and 1979 — MOSTLY FROM THE SOUTHWEST

JOHN H. HUDSON, The W. P. Fraser Herbarium, University of Saskatchewan, Saskatoon, S7N 0W0.

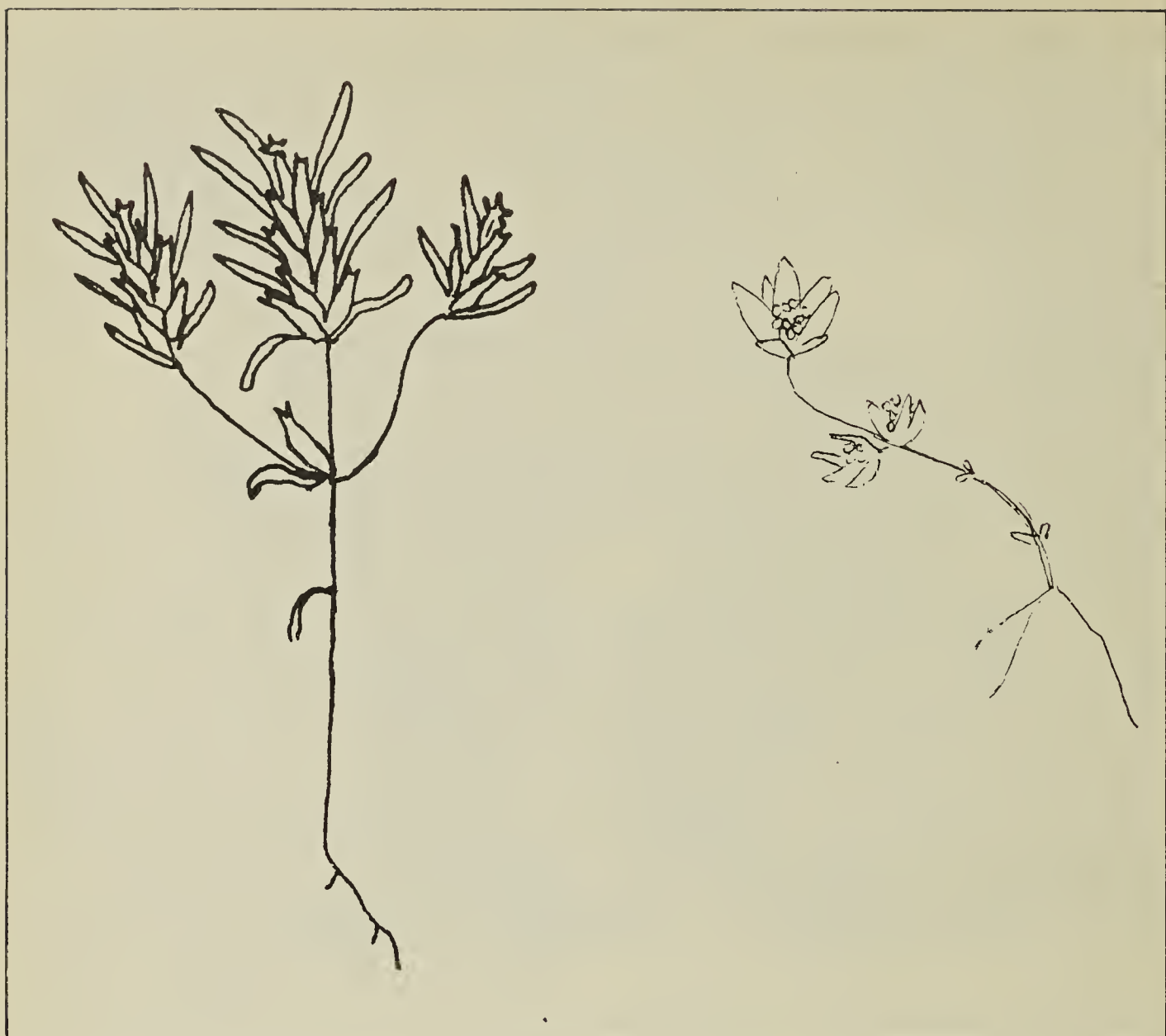
The year 1978 provided me a fine yield of botanical novelties. 1979 was not nearly as good for general collecting because of widespread dry weather but I did get a few specimens of interest. Here from the harvest of the two summers will be reported two plants not before reported from Saskatchewan, three species which have not been collected since early times and twelve other rarities. Duplicates have been or will be sent to the following herbaria: SASK, DAO, REG.

New to Saskatchewan is *Oenothera andina* Nutt., collected as #3560 on 2 July 1978 at top of bank of grassy arroyo, S.W. ¼ 25-3-XXX W.3rd, near Altawan. I have tried to draw a specimen; it consists mainly of seed pods and subtending bracts. When one adds that the plant is 5-10 cm high and has bright yellow flowers a glorious 2 mm across, one sees that this is another hands-and-knees record, as a friend expressed it to me. Breitung excluded this from the Saskatchewan list because although John Macoun had collected it at Medicine Hat and Pend d'Oreille, Assiniboia Territory, these places ended up in Alberta in 1905.²

The other novelty is *Psilocarphus elatior* Nutt., Woolly-heads, collected as #3770 on 17 June 1979 and as #3812 on 21 July 1979, both on a dried-up slough bottom amid till hills, L.S.D. 11 in 22-3-XXIX W.3rd, some 5 miles south of Merryflat. This little

wooly composite looks something like *Gnaphalium palustre*, Western Marsh Cudweed, except for having the florets surrounded by foliage leaves instead of scarious bracts, and by having the stem-leaves opposite. In the drawing the stem-leaves have fallen off because of drouth. This southwestern part of the province was dry by mid-June, and #3770 was wretched stunted stuff. I came back in July hoping rain had fallen in the meantime. It hadn't — a local rancher told me then that there had been no rain since May — and #3812 was just as dried up and stunted as #3770. I saw plants 5 mm high with heads 2 mm across. The species has been found at Redcliff, Alberta, according to Moss.¹³

Of the retakes of old records, the prettiest plant was *Downingia laeta* Greene, collected as #3819 on 22 July 1979 on L.S.D. 13 in 10-21-XXVI W.3rd (on Highway 21 just south of the turnoff to Mendham), an almost pure stand on the clayey mud of a cultivated slough bottom in a grain-field. This small annual has a pale blue-violet corolla which is unsymmetrically 5-parted with 2 lobes above and 3 below, like those of its relatives in *Lobelia*. A field mark is that these flowers seem to be on stalks 1-2 cm long; however these "stalks" are really ovaries that plump up with time to become seed pods, so that the flowers are in fact sessile. The slough was so densely packed with



Oenotheria andina (left) and *Psilocarphus elatoir* (right), both natural size.

John H. Hudson

Downingia that the mass of flowers looked like water tinged blue from the sky.

The earlier Saskatchewan collections of *Downingia* were, as Porsild transcribes the labels, at "Crane Lake, Skull Creek; in brackish marshes, July 3, 1894; same place, in a bog. John Macoun #7532 and #7533 (CAN.)"¹⁴ Now Skull Creek does not flow into Crane Lake, though it passes within 3 miles thereof on its way to empty into the alkali lakes north of Sidewood. Fairly plainly the collections were made in groundwater bogs on or near Skull Creek, and the words "Crane Lake" mean only the general locality. A station of Crane Lake on

the C.P.R. is indicated in less modern maps. I have collected *Downingia* some 12 miles up-river at Skull Creek P.O. while visiting the Steve Manns there in 1958. And one last item to relate is that Wayne Harris of Prince Albert collected it from this same Highway 21 location two days later. Even the circumstances were the same; we both drove by, then the realization seeped through to the conscious mind in both cases that there was something not quite usual to the slough, and we came back to check. *Downingia* was seen also in two more sloughs 1½ to 2 miles northward toward Leader by both observers.

Another retake of an early

collection was *Alopecurus carolinianus* Walt., collected as #3771 on a dried-up slough bottom in till prairie on L.S.D. 11 in 22-5-XXIX W.3, 17 June 1979. This is the same land number as for the *Psilocarphus* collection, for the two sloughs were 50 yards or so apart. This little grass looks much like the common *Alopecurus aequalis* Sobol., Short-awned Water Foxtail, other than being 5-10 cm high, annual in habit, and with awns projecting 1-2 mm from the spike. The earlier Saskatchewan collection is given as at "Wood Mountain Trail" in Scoggan.¹⁵ One would guess that this is a Macoun collection from his journey of 1895.

The third retake of a plant long uncollected is two collections of *Cryptantha kelseyana* Greene; #3554, 25 June 1978, Prairie Wildlife Interpretive Centre, Webb, L.S.D. 7 in 32-14-XVI W.3, on gopher hole on dry prairie, fine sandy loam soil; #3556, 2 July 1978, at Altawan on L.S.D. 15 in 24-3-XXX W.3rd, on burnout flat in valley bottom among *Poa secunda/Bouteloua* grassland. This is a small borage differing to the eye from the commoner *Cryptantha fendleri* in being branched from the base rather than only in the inflorescence, and in growing on disturbed dry prairie rather than loose sand. The decisive difference is in the nutlets and needs magnification: *C. kelseyana* has three smaller warty nutlets and one larger smooth one, *C. fendleri* has four like smooth nutlets. The Fraser Herbarium has an undated specimen collected by T. N. Willing at Maple Creek, presumably sometime in or near the decade 1900-1910. The report in Fraser and Russell of *C. crassisepala* (T. & G.) Greene was based on this specimen.⁴ Maher, Argus, et al. record *C. Kelseyana* also from Fort Walsh.¹²

The rarities which are not novelties

may be run through more shortly.

Antennaria dimorpha (Nutt.) T. & G.) #3492, 14 May 1978, Altawan, near centre 25-3-XXX W.3rd, vernal moist clayey bottom of draw. Reported earlier by Hudson from Climax and Divide.⁸ Reported from Val Marie by Maher, Argus, et al.¹²

Atriplex truncata (Torr.) Gray, #3656, 13 August 1978, Webb, west edge L.S.D. 12 in 33-14-XVI W.3rd, saline cutbank of alkali slough. This is another small *Atriplex* like the common *A. argentea* and that *A. powellii* written about by Hudson but differing from both these in the fruiting bracts some 2 mm long, 3-toothed at tip but without other marginal teeth or dorsal tubercles.¹¹ Maher, Argus, et al. give Maple Creek and Piapot as other localities.¹²

Crepis occidentalis Nutt. #3540, 17 June 1978, Lemsford ferry, L.S.D. 15 in 9-24-XXIII W.3rd, well vegetated although gravelly and eroded S.W. facing slope near head of ravine. What caught my eye was the combination of a yellow-flowered Lettuce subfamily composite with runcinate-pinnatifid leaves, yet the plant was clearly villous-pubescent all over. Maher, Argus, et al. give as other localities Cypress Hills, Lancer ferry, and Matador.¹²

Eleocharis parvula (R. & S.) Link var. *anachaeta* (Torr.) Svenson. #3658, 13 August 1978, Webb, L.S.D. 11 in 28-14-XVI W.3rd, sandy and gravelly shores of Goose Lake. The typical variety was wrongly reported by Harms and Hudson from the Goose Lake which is near Tessier.⁵ Dr. B. Boivin examined both the Webb and Tessier material and found them both to be var. *anachaeta*, without perianth bristles on the achenes. Var. *parvula* should have bristles on the achenes. I had mistakenly taken the withered remains of stamens in the Tessier material to be perianth-

bristles.

Festuca octoflora Walt. Six Weeks' Fescue. #3555, 2 July 1978, Altawan, L.S.D. 15 in 24-3-XXX W.3rd, very dry prairie on flat by arroyo. A small annual grass, about 10 cm high, with the panicle reduced virtually to a raceme of spikelets which have notably many (about 10-14) florets. Breitung reports this in Saskatchewan only from Piapot.² A weedy grass widely distributed in more temperate parts of North America.

Helianthus tuberosus L. Jerusalem Artichoke. #3762, 8 October 1978, Goodwater, SW $\frac{1}{4}$ 17-5-XII W.2nd, wooded banks of Souris R. A big perennial sunflower with cordate-based ovate leaves and cigar-shaped tubers. Reported by Hudson from Northgate, and by Maher, Argus, et al. from Gainsborough.^{7, 12}

Mimulus glabratus H.B.K. var. *fremontii* (Benth.) Grant. Small Yellow Monkey-flower. #3632, 29 July 1978, Welby, N.W. corner L.S.D. 1 in 3-18-XXX W.1st, cold flowing brook. This plant and its earlier Saskatchewan stations at Round L. and Whitewood have been fully described by De Vries.³

Polygala verticillata L. #3623, 27 July 1978, Yarbo, L.S.D. 2 in 30-19-XXXII W.1st, prairie remnant on calcareous slope of knoll. Reported earlier by Hudson from Estevan.¹⁰

Polygonum confertiflorum Nutt. #3558, 2 July 1978, Altawan, L.S.D. 15 in 24-3-XXX W.3rd, on burnout flat of valley bottom. #3565, 2 July 1978; Altawan, L.S.D. 3 in 25-3-XXX W.3rd, cobbly arroyo bottom. #3768, 17 June 1979, Altawan, NW $\frac{1}{4}$ 25-3-XXX W.3rd, dampish spot (dry plunge basin) in arroyo bottom. #3813, 21 July 1979, Merryflat, L.S.D. 11 in 22-5-XXIX W.3rd, dry grassy slough bottom. This small knotweed has its flowers in terminal bracted spikes, the

bracts being more or less white-margined. It was collected by John Macoun in 1895 "near Battle Creek, south of the Cypress Hills", acc. to Scoggan — a location which can be only a few miles from that of #3813 — and by myself along Davis Creek south of the East Block of Cypress Hills.^{15, 9}

Scrophularia lanceolata Pursh, Figwort. #2553, 25 June 1978, Webb, Prairie Wildlife Interpretive Centre, L.S.D. 16 in 28-14-XVI W.3rd, moist brushy north-facing slope of embankment of 1882 grade of CPR in creek valley. This was reported by Hudson from Mortlach, based on collections also from the original grade of the CPR (abandoned 1902).⁶ This plant of the American Midwest must have entered during railway building; I have not seen it elsewhere than these two stations. At P.W.I.C. a daughter colony had gotten established $\frac{1}{4}$ mile up the creek from the old railway line; this is not a rapid spread for almost 100 years. Perhaps seed production is handicapped by the lack of the proper pollinating insect. The rhizomes spread vigorously when established.

Sporobolus neglectus Nash, Small Dropseed. #3755, 7 October 1978, Brooking, SE $\frac{1}{4}$ 36-6-XIX W.2nd, on gravel of little used railroad tracks. This has been reported from Estevan by Hudson.¹⁰ Boivin had already included Saskatchewan in its range without locality.¹ W. G. Dore was so kind as to inform me in a letter that the locality in question was Halbrite and that the collection was his own on "railway tracks by station". The plant is native in the American Midwest — it must be spreading by railways.

Viburnum lentago L, Nannyberry. #3516, 6 June 1978, Pinto, L.S.D. 5 in 25-1-VI W.2nd, base of north-facing wooded slope in ravine. Shrubs 2.5 m high. The elliptic finely serrate leaves,

suggesting those of pincherry, differ from the maple leaves of the more familiar Bush Cranberry species of *Viburnum*. This shrub has several earlier known stations in our southeast corner. Maher, Argus, et al. give also Tantallon, Wapella, and St. Marthe de Rocanville, while Breitung mentions Gainsborough.^{12, 2}

¹BOIVIN, B. 1967. Énumération des Plantes du Canada. Provancheria #6, Université Laval, Quebec.

²BREITUNG, A. J. 1957. Annotated Catalogue of the Vascular Flora of Saskatchewan. Am. Midland Nat. 58 (1):1-72.

³De VRIES, B. 1971. *Mimulus Glabratus* HBK var *Fremontii* (Benth) Grant. Blue Jay 29(1):39-40.

⁴FRASER, W. P. and R. C. RUSSELL. 1944. An Annotated List of the Plants of Saskatchewan. Univ. Saskatchewan.

⁵HARMS, V. L. and J. H. HUDSON. 1978. Some Vascular Plants New to the Flora of Saskatchewan. Can. Field-Nat. 92(4):389-391.

⁶HUDSON, J. H. 1951. Flora List of the Mortlach District, Southern

Saskatchewan. Can Field-Nat. 65(6):197-210.

⁷HUDSON, J. H. 1958A. New Plant Records for Saskatchewan, 1957. Blue Jay 16(1):20-21.

⁸HUDSON, J. H. 1958B. Some New or Little Reported Saskatchewan Plants, Blue Jay 16(3):123.

⁹HUDSON, J. H. 1962. New Plant Records for Saskatchewan. Blue Jay 20(3):120.

¹⁰HUDSON, J. H. 1973. Additions to the Flora of Saskatchewan, 1972. Blue Jay 31(2):112-114.

¹¹HUDSON, J. H. 1978. *Atriplex Powellii* and Cabri Lake. Blue Jay 36(3):137-138.

¹²MAHER, R. V., G. W. ARGUS, V. L. HARMS, and J. H. HUDSON. 1979. The Rare Vascular Plants of Saskatchewan. Syllogeus #20, National Museums of Canada, Ottawa.

¹³MOSS, E. H. 1959. Flora of Alberta. Univ. Toronto Press.

¹⁴PORSILD, A. E. 1940. Miscellaneous Contributions from the National Herbarium of Canada. II. Can. Field-Nat. 54(5):68-69.

¹⁵SCOGGAN, H. J. 1978. Flora of Canada, parts 1, 2, & 3. National Museums of Canada, Ottawa.

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NEW MANITOBA LICHENS

JAMES L. PARKER, Box 99, Gilbert Plains, Manitoba, R0L 0X0.

In the years 1977 and 1978 I collected a number of lichens in the Duck Mountain vicinity. Specimens were sent to the National Museum of Natural Sciences in Ottawa, and identified by P. Y. Yong. C. D. Bird's *A Catalogue of the Lichens Reported from Alberta, Saskatchewan and Manitoba* is the standard authority on lichen distribution in those provinces. The identifications were submitted to Dr. Bird, who writes that the following listed appear to be additions to the reported flora of Manitoba.

The Cowan specimens were collected in thin pine forest, on or along the Campbell Glacial Beach. Gilbert Plains specimens are from broad-leaved woods. Other collections are mainly coniferous forest.

The following list gives the specific name as determined by Yong, the medium in which the lichen was growing, and the nearest geographical feature listed in the Manitoba Gazetteer. All specimens

and notes were donated to the National Museum of Natural Sciences.

Cladonia bacillaria (Ach.) Nyl. *Pinus*. Cowan.

C. macilenta Hoffm. *Pinus*. Cowan.

Peltigera elizabethae Gyelin. Debris. Gilbert Plains.

Physconia detersa (Nyl.) Poelt. *Abies*. Baldy Mountain.

Usnea sorediifera (Arn.) Lynge aggregate. *Picea*. Head of Shanty Creek.

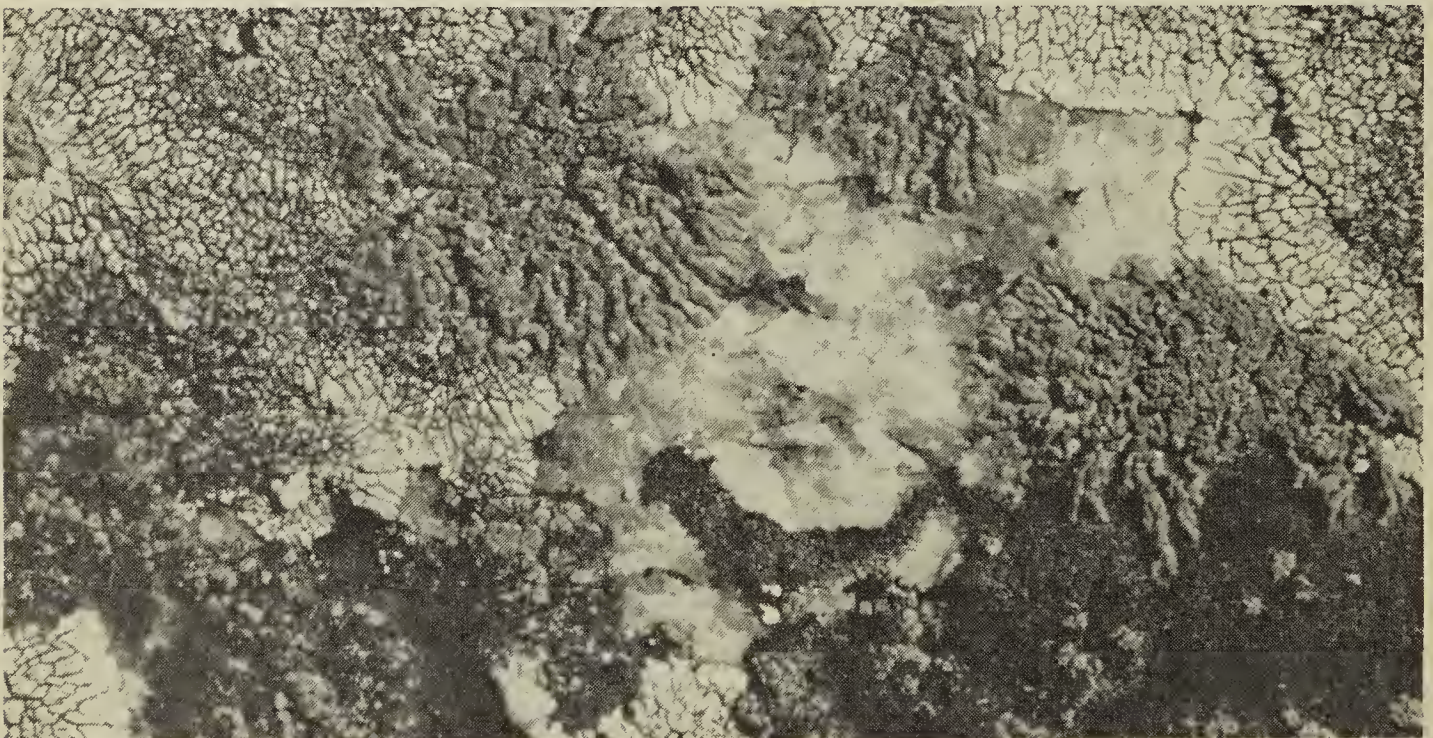
U. subfloridana Stirt. *Picea*. Head of Shanty Creek.

U. filipendula Stirt. *Picea*. Singush Lake.

Phaeophysicia pusilloides (Zahlbr.) Essl. *Betula*. Gilbert Plains.

Ramalina intermedia (Del. ex Nyl.) Nyl. *Picea*. Singush Lake.

I wish to thank Dr. Yong for the identifications, and Dr. Bird for searching the Manitoba records.



Lichens on a rock

Gary W. Seib

CRIP: THE CONSTANT DANCER

GEORGETTE K. MAROLDO, Texas Lutheran College, Seguin, Texas 78155.

Crip: The Constant Dancer is a biographical study of a captive Whooping Crane and, as such, it is concerned with the biological and behavioral problems related to the management and preservation of an endangered species. This study identifies persistent questions involving captive breeding, fertility/longevity, nesting vs. artificial incubation, parental care, filial and sexual imprinting, submissive-dominant behaviors, personal space and optimal enclosure area, and possible stress and effects that may be related to egg removal and other practices designed to increase egg production.

The life of the captive Whooping Crane Crip, rich and varied by any standard, encompasses the recent history of concerted efforts on the part of the American and Canadian governments and people to save his species from extinction. In fact, he is an embodiment of all such efforts being made during his lifetime, and he continues as a vital agent in the struggle to insure propagation of *Crus americana*. When Crip, who is the property of the United States Department of the Interior, was first observed at Aransas National Wildlife Refuge, Texas, in either 1946 or 1947, there were 31 migratory Whooping Cranes, plus 2 in captivity, in the world by official count during the latter year (See Note a), and only one or two remained of the non-migratory flock in Louisiana. Through conservation efforts, this number increased by 1979 to 74 wild migratory Whooping Cranes, to which can be added 8 or 9 from the Foster-Parent Experiment, Grays Lake, Idaho. Twenty-two Whooping Cranes reside at Patuxent Wildlife Research Centre,

Maryland, 2 at the International Crane Foundation, Wisconsin (one on loan from Patuxent and the other from the Audubon Park Zoo in New Orleans), and 2 at the San Antonio Zoological Gardens and Aquarium, bringing the world total to 108 or 109. The Louisiana non-migratory flock has disappeared, to survive in the mixed genes of Josephine and Crip's remaining offspring.

Today, Crip and his fifth known mate Ektu live peacefully and contentedly, unaware of his renowned fame and special mission, at the San Antonio Zoo. Cranes, and especially Whooping Cranes, always rare, have resided in zoos in the past, where they were available for research and study.^{7, 8, 19, 31} However, unlike Crip, none has attained such "star status." Although Crip has been a captive most of his life, he was once part of the migratory population that journeys 2400 miles from their breeding grounds at Wood Buffalo National Park, Northwest Territories, to spend the winter at Aransas National Wildlife Refuge, in Texas, raising the young they bring with them. In spring they return to Canada. Both phases of the journey are perilous and exhausting for the cranes. This might have been fatal for Crip, who survived the migration from his nesting grounds only to be denied a return because of an injury to his left wing, probably sustained during his southward flight.^{3, 20}

Crip's Age

Crip's exact age can only be guessed. Although Allen calls him "Old Crip," recalling an old friend

several years later, Crip was possibly in mature white plumage, though hardly more than a few years old, when first encountered by Allen at Aransas in the winter of 1947.⁴ Thus, at the time of writing (1979), Crip is about 34 years old, the "middle of the road" even for cranes, whose life expectancy, according to Erikson is probably over 60 years.¹³ Certainly, Crip is a tall, majestic bird who carries his age well, despite an obviously crippled wing. Now as always, he is inclined to stride gracefully and vigorously about his domain. He is easily over four and one-half feet tall, stalwart and proud, with a glittering eye and a sovereign mien.

Crip's Early Mates

Evidence suggests that Crip has had a series of mates. Although the precise number is unknown, five have been identified. Deriving the bulk of her information from Allen's various accounts, McNulty reports that Crip and his flightless mate, having spent the summer of 1947 in the Middle Pond Territory at Aransas, were evicted in the fall by the returning rightful owners.²⁰ They moved on to Rattlesnake Point Road, where they stayed until March 1948, when the female died a lingering death, shot by an unknown assassin. Evidently, Crip did have a female by his side in his early years at Aransas, not just a companion. However, since there is no evidence of nesting, possibly due to immaturity, it must be assumed that Crip and the female may not have mated at this time.²⁷

After the death of his first mate, Crip's resumed bachelorhood did not last long. On 17 April 1948 while at Rattlesnake Point Road Territory, Allen observed him calling to a lone migratory whooper who was flying north. This crane flew to his side, and remained with him at Aransas from April 1948 until October 1949, one

and a half years. Again, no nesting was observed, although it was assumed by Allen that this crane was a female.²⁰ Then, as now, sexing of Whooping Cranes is difficult and uncertain, Allen rarely made an error, but proof of accuracy depends on the results of pairing.

Josephine and Crip

Only less famous than Crip himself was his third mate, Josephine, "Queen of the Whooping Cranes".⁶ She was believed to be one of the last survivors of the non-migratory Louisiana Whooping Cranes who lived in the quiet marshes around Lac Blanc in Vermilion Parish, southwest Louisiana, until this population disappeared. In the fall of 1940 a severe storm, at the fringes of a hurricane, inundated the marshland where Josephine lived. However, her subsequent injury was probably not the result of this cataclysm, but of a hunter's bullet.¹⁸ Allender and Archibald state that a farmer of Evangeline Parish after having captured an injured crane in a rice field, gave it to L. O. LaHaye of Eunice, who nursed it back to health.⁵ A year later this crane was formally recognized as a whooper and sent to Audubon Park Zoo, where she was introduced as Josephine. From the fall of 1941 until the fall of 1948, Josephine remained alone in her enclosure at the zoo. It became obvious to Allen and others that Josephine with a mate could participate in a captive breeding experiment, which was being inaugurated, to help insure survival of her species.³

Pete entered upon the scene, a male Whooping Crane that had been shot along the flyway in Nebraska during migration. He had been captured and sheltered by members of the Gothenburg Gun Club, in a fenced area on the Platte River since May 1936. Before joining Josephine, on loan from the Audubon Park Zoo, in a



*Figure 1. Josephine and Pete at Aransas National Wildlife Refuge, Texas, May, 1949.
L. H. Walkinshaw*

150-acre enclosure at Aransas in late 1948, Pete, blind in the left eye and missing his right wing primaries, was displayed at the St. Louis Zoo Bird House from 6 November to 19 December.³²

To everyone's delight, Josephine and Pete, danced and mated in March and April 1949, and eggs were discovered at Aransas on 30 April and 1 May. Unfortunately, chicks never emerged, the parents left the vicinity of the nest after smashing their infertile eggs on the 24th day of incubation. On the evening of 21 July or early the following morning, Pete died of natural causes. Allen dubbed him a "game old warrior," who had certainly done his best for his species, alas, with no viable results.²

Once again Josephine needed a mate. No time was lost, and Crip was so designated. Early in October 1949, a posse was organized at Aransas, and he was captured. Crip's second mate, who was with him, had flown off at the last moment, and he was apprehended.² Undaunted, Crip joined Josephine in the enclosure,

with no apparent clash of wills. From all accounts, these cranes, whose species usually pair for life unless the death of one intervenes, were ideally suited to one another, and seemed to sense their awesome responsibility.

Josephine and Crip danced, mated, and built a nest in the spring of 1950 at Aransas, and on 22 April an egg was laid. This egg had the distinction of being constantly observed from a 20-foot observation tower by the staff, and at different periods, the two leading authorities on Whooping Cranes, Robert Porter Allen and Lawrence H. Walkinshaw.^{2, 30} Despite these promising eventualities, there appeared in a New Orleans newspaper a report to the effect that Superintendent Douglas of the Audubon Park Zoo was at that time seeking a return of Josephine, perhaps, to swap her for a "Panda in a northern zoo".³³

The first Whooping Crane ever hatched in captivity, called Rusty because of his russet chick-down, emerged late on 24 May or early the next morning. Unfortunately, this ap-

parently healthy, tiny chick disappeared without a trace only 4 days after hatching, for reasons unknown.³ It seems, by all accounts, that even in so short a time, Crip was a solicitous and tender father.

Taking as failures the events of the previous year, in conjunction with the loss of her eggs in 1951, Douglas retrieved Josephine from the breeding experiment at Aransas on 13 December. In the confusion following his unannounced arrival at the Refuge, he managed not only to regain custody of Josephine, but also to grab Crip, taking them both back with him to the Zoo.²⁰ Three days later the cranes were formally welcomed to New Orleans.⁹

For the first 4 years at the Audubon Park Zoo nothing of consequence happened to further the propagation of Whooping Cranes in captivity. The situation changed dramatically in 1955, to inaugurate a decade of remarkable activity. Table 1 outlines the egg production and offspring of Josephine and Crip at the Audubon Park Zoo from 1955 to 1965. The only offspring surviving to maturity were George, Georgette, Pee Wee, and Pepper (Note b). Although many of the offspring of Josephine and Crip led short lives, the skins of several of them have been preserved; and through the art of the taxidermist, they subsist in life-like form, adding to the lore of the Whooping Crane. George H. Lowery, Jr., late director of the Museum of Natural Science at Louisiana State University, Baton Rouge, played a key role in this lasting achievement (Note c). For example, Josephine and Crip's chick that lived for 45 days in 1956 is part of an exhibit at the LSU museum, called, "The Louisiana Prairie Long Ago." The youngster is overshadowed by two adult whoopers, themselves preserved for many generations.

Table 1 further indicates by asterisk other chicks of this pair also available for viewing at the museum.

During the early years at the Audubon Park Zoo several eggs were broken by the cranes themselves, for reasons unknown, causing the Bureau and the Zoo officials to consider some precautions. Thereafter, many of the eggs were removed as soon as possible and artificially incubated or placed in the care of expert crane-egg hatchers. The record shows that conditions did not improve, and to this day, hatching healthy chicks is risky, laden with biological and psychological problems yet to be solved by research. "Pulling" the eggs, however, did increase egg production. Cranes typically lay a two-egg clutch, but if the eggs are systematically removed, the female often will continue to lay.

The spring before Josephine died, 1964, she had laid 10 eggs. Two of them hatched, but the chicks did not live long. Following this "ten-egg-tragedy," the Bureau began to wonder if Josephine and Crip were too old to produce healthy chicks.²⁰ No one has yet addressed the effects of psychological and physiological stress possibly resulting from these procedures.

Josephine, the last of the non-migratory Whooping Cranes, died on 13 September 1965. Five days earlier, Hurricane Betsy hit New Orleans and in its wake there was the usual aerial survey of damage. A helicopter flying low came too close to Josephine's enclosure and in her fright [possibly coupled with stress and exhaustion] she was fatally injured.⁵ After a series of events, Lowery was able to get Josephine's skin. She stands alone at the LSU museum against the day she will return to Audubon Park Zoo to take part in a special exhibit.

TABLE 1 — Egg Production and Offspring of Josephine and Crip at the Audubon Park Zoo : 1955-1965

Year	Date Laid	No. Eggs	Nested/ Incubate	Condition	Date Hatch	Name	Date Died	Cause/ ^a Death	Life- span
1955	5/29	1	Nested	Broken					
1956	4/28	1	Nested		5/29		7/13	A	45 days*
	5/02	2	Nested		6/01		6/02	B	2 days
1957	4/18	1	Nested		5/18	George	11/8/78	C	21 years
	4/21	2	Nested		5/21	Georgette			
1958	3/28	1	Nested		4/30	Pee Wee	6/20/70	C	12 years
	3/30	2	Nested	Burst					
	5/21	3	Nested	Infertile					
	5/24	4	Nested	Infertile					
1959	2/14	1	Nested	Broken					
	2/17	2	Nested	Broken					
	3/06	3	Incubate	Infertile					
	3/09	4	Incubate	Dead chick					
	3/12	5	Nested	Addled					
	5/05	6		Broken					
	5/08	7		Dead chick					
1960	2/13	1	Incubate	Infertile					
	2/16	2	Incubate	Infertile					
	2/19	3	Incubate	Infertile					
	4/16	4			5/17		6/02	A	16 days*
	4/18	5			5/18		5/18	G	8 hours*
1961	2/25	1	Incubate						
	2/28	2	Incubate						
	3/12	3		Broken					
	3/15	4			4/18	Pepper	2/14/74	D	12 years*
1962	3/05	1			4/08		4/19	E	11 days
	3/08	2	Nested	Infertile					
	5/01	3		Fert/dead					
	5/04			Fert/dead					
	5/23	5			6/25		7/02	G	7 days*
	6/26	6	Nested	Broken					
1963	3/12	1	Nested	Broken					
	3/22	2	Nested	Broken					
	3/25	3	Nested	Hole					
	4/08	4	Incubate	Infertile					
	4/11	5	Nested	Broken					
	5/01	6	Incubate	Infertile					
	5/05	7	Incubate	Infertile					
	5/17	8	Incubate	Broken					
1964	3/28	1	Incubate	Premature				G	40 hours
	3/31	2	Incubate		5/02	Zoe	5/20	F	18 days
		3	Incubate	Infertile					
		4	Incubate	Infertile					
		5	Incubate	Infertile					
		6	Incubate	Infertile					
		7	Incubate	Infertile					
		8	Incubate	Infertile					
		9	Incubate	Infertile					
		10	Incubate	Infertile					
1965		1	Incubate	Infertile					
		2	Incubate	Infertile					
	5/13	3	Incubate	Fert/dead					

Note: Fifty-two eggs were laid, 12 hatched, 4 lived to adulthood, 1 remains alive.

^aCause of death: A = Aspergillosis; B = Disappeared; C = Injury; D = Infection; E = Operation; F = Defect; G = Unknown



Figure 2. Josephine and Crip with George and Georgette at Audubon Park Zoo, 24 May 1957. Parker's

Rosie and Crip

The migratory Whooping Crane Rosie, on loan to the Audubon Park Zoo at the time, became Crip's fourth mate. Sometime after 3 May 1956, she and a former mate had left Aransas on their flight to Wood Buffalo, but went no farther than Lampasas County, Texas, because Rosie had crippled a wing on a high wire. Her mate stayed with her until a need for

water prompted him to resume his migration. Following her capture, Rosie was taken to the San Antonio Zoo, where she was accurately identified as a female by the late director, Fred Stark, who immediately advised the Service of her availability.²⁰

During the 8 years of Rosie's solitary residence at the San Antonio Zoo, George and Georgette, offspring of Josephine and Crip, reached

maturity at Audubon Park Zoo. Rosie was brought from San Antonio to New Orleans to pair with George in April 1964, thereby augmenting the reproductive efforts of Josephine and Crip. In the spring of 1965, in their newly constructed pens, they danced and mated but did not nest. It should be noted that during the winter of 1964-65, Roxie Laybourne, employing her own technique, was able to sex Josephine and Crip's four offspring, determining George, Georgette and Pepper to be male, and Pee Wee to be female. Georgette was now called George I.²⁰ Consequently, Pee Wee and George I were paired, but did not prove compatible. The reason is not far to seek. An autopsy performed on Pee Wee in 1970 disclosed that he was a male.

About this time, in 1964, Can-Us, the property of the Canadian and American governments, was captured in Canada, and, at first, taken to Monte Vista National Wildlife Refuge, Colorado. Later in 1966 he was transferred to Patuxent. Can-Us, yet another migratory whooper in captivity, eventually will play a role in the captive-breeding experiment and indirectly in the life of Crip.

As noted above, following Josephine's death and the realization that the union of Rosie and George was unproductive, the Bureau and the Audubon Park Zoo decided to place Rosie with Crip. Evidently well-suited to each other temperamentally, the pair, nevertheless, failed to nest in the spring of 1966. This fact, in connection with previous arrangements and agreements between the Bureau and the Audubon Park Zoo, prompted the former to recommend transfer of Rosie and Crip to the San Antonio Zoo (Notes d and e). The move was accomplished on 5 January 1967; hopefully, it would stimulate reproduction, and such proved to be the case. Table 2 outlines the egg

production and offspring of Rosie and Crip at the San Antonio Zoo from 1967 to 1970. Tex, named after her native state, was the only offspring surviving into maturity.

The first chick hatched in 1967 had suffocated or been stepped on inadvertently by the parents. This accident may have resulted from the fact that the cranes had minimal personal space in captivity. Inasmuch as each crane family in the wild claims large territories, the question of space appears to require further study. Consequently, Stark, concerned about the safety of Tex, the second chick hatched in 1967, reared her in his own home for the first several days of her life. As a result, she became imprinted upon human beings rather than cranes, and this would have far-reaching effects later on. Tex, who weighed a pound and was fourteen inches tall at 16 days, flew by jet to Patuxent secure on the lap of R. C. Erickson, Assistant Director for Endangered Wildlife Research. Patuxent had been in operation for only a year, but its concern for Whooping Cranes, among other endangered species, was evident in their many efforts on their behalf.

After Rosie and Crip's propagation failure in 1968, questions again arose concerning the fertility of Rosie and, especially, Crip. A biologist from Patuxent was sent to the San Antonio Zoo to conduct tests on the cranes.³⁴ In 1969 Rosie began laying eggs again. Interestingly, when a decoy egg was placed in the nest as a substitute for one of her own removed eggs, she rolled it away, and built another nest.²³ Variations of this practice occur from time to time. Walkinshaw recalls that a Sarus Crane in September 1965 was found incubating 2 crane eggs plus 1 large snail shell (Note f). Today, decoys are rarely, if ever, used because the crane continues to lay without them.²⁵

TABLE 2 — Egg Production and Offspring of Rosie and Crip at the San Antonio Zoo : 1967-1970

Year	Date Laid	No. Eggs	Nested/ Incubate	Condition	Date Hatch	Name	Date Died	Cause/ ^a Death	Life-span
1967	6/7	1	Nested		7/6		7/7	A	1 day
	6/9	2	Nested		7/9	Tex			
		3							
		4							
1968	6/2	1	Nested	Infertile					
1969	4/25	1		Broken					
	4/29	2	Incubate	Infertile					
	5/6	3	Incubate	Infertile					
	5/12	4	Incubate	Infertile					
	5/16	5	Incubate	Fert/dead					
	6/6	6	Nested		7/5	Firecracker	7/11	B	6 days
1970	3/20	1	Incubate	Fert/dead					
	3/22	2	Incubate	Fert/dead					
	3/29	3	Incubate	Infertile					
	4/3	4	Incubate	Fert/dead					
	4/9	5	Incubate	Infertile					
	4/13	6	Incubate	Fert/dead					
	4/24	7	Incubate		5/27		5/29	C	2 days
	5/11	8	Nested	Flooded					

Note: Nineteen eggs were laid, 4 hatched, 1 lived to adulthood and remains alive.

^aCause of death: A = Suffocated or stepped on; B = Defect; C = Infection.

Toward the end of May after having laid the fifth egg of the season, Rosie was given a rest.²² Later, on 5 July the chick from her sixth egg hatched, and it was aptly called “Firecracker.” At this time, celebrated Crip had offspring everywhere. George, George I, Pee Wee, and Pepper at the Audubon Park Zoo, Tex at Patuxent, and now Firecracker at the San Antonio Zoo. The largest number of Whooping Cranes ever held in captivity were sired by Crip. Sadly, Firecracker lived only 6 days. Death resulted from slipped tendons in the knees.

With the exception of Griswold’s research, little had been done on rearing Whooping Cranes in zoos, and in the late 1960’s Audubon Park and San Antonio came to rely, more and more, on Patuxent for guidance.¹⁴

Furthermore, Whooping Cranes were the property of the United States Department of the Interior, on loan to the zoos, so ultimately the zoos were in a subordinate position. Recent captive whoopers are the joint property of the Canadian Wildlife Service and Interior. Patuxent agreed to provide the zoos with detailed instructions concerning daily care, diet and diet supplements, medical treatment, handling pairs or singles, artificial light stimulation, retrieval of eggs, disposition of eggs, incubation, brooding, rearing, and autopsy reports (Note g).

Pee Wee, offspring of Josephine and Crip, died on 20 June 1970, at the Audobon Park Zoo, of air sacculitis and pneumonia, resulting from injuries sustained when he “flew against

the pen in an effort to fight a neighboring sandhill crane" (Note h). His death was to a large extent ignored in the public press and related comment; and no records presently exist at the Audubon Park Zoo.

The spring before Rosie died, 1970, she had laid eight eggs. One of the chicks hatched at Patuxent but it did not survive. Rosie did not appear to be herself in the spring of 1971; she did not lay any eggs. On 16 June she was found in her enclosure unable to stand and evidently seriously ill. All efforts failed to save her, and she died in the hands of zoo officials at 17:55. The autopsy that was performed at Patuxent revealed that Rosie had succumbed to a tumor in the liver plus other complications [possible stress and exhaustion] (Note i).

Crip, again alone, remained at the San Antonio Zoo. At this time, he seemed destined to remain an old widower.

Essential to any captive-breeding program is the successful sexing of the principals involved. This proved crucial to the Audubon Park Zoo where, despite various efforts, they still wished to verify the sexes of the cranes they held. Safe methods of sexing were also sought. George Archibald of the recently established International Crane Foundation, Baraboo, Wisconsin, visited the zoo for 4 days in February 1972 to test his method for sexing cranes (Note j). His preliminary attempt to determine the sexes of Crip's three offspring by studying their unison calls was partially successful. According to Kepler the behaviour of a dominant female may be so similar to that of a male that unison calls may be the only way of sexing.¹⁷ Now firmly established, this safe method of sexing should prove very valuable. By 1974 the Audubon Park Zoo found out through chromosome Karotypy, performed by

Tulane University Medical Center, that all three of their cranes were, indeed, males (Note k). The San Antonio Zoo had their lone, male Whooping Crane, Crip, while Audubon Park held his three male offspring. Shopping around for captive female Whooping Cranes of breeding age in order to continue the breeding experiments at the zoos was going to be a difficult task. Related to this at Audubon Park Zoo and elsewhere was a persistent, yet, pulsating emphasis on the possibility of re-establishing the non-migratory Whooping Cranes in Louisiana. As noted above, the surviving offspring of Josephine and Crip constituted the only gene bank of the lost flock.

In any case, the Audubon Park Zoo went directly to the Secretary of the Interior, Rogers C. B. Morton, and their own Louisiana Senator J. Bennett Johnston with their requests for a suitable female Whooping Crane. The San Antonio Zoo targeted Patuxent with the same request. Early in the negotiations the replies to the Audubon Park Zoo were not encouraging, whereas, those to the San Antonio Zoo were. Always uppermost in the minds of those concerned with Whooping Crane welfare at the Department of the Interior, however, was the fact that at Audubon all three cranes could be lost at one time, if any catastrophe hit the Zoo. The intention to separate the cranes eventually seemed justifiable. The wild Whooping Cranes are similarly threatened by natural or man-made calamity.

The sudden death of 12-year-old Pepper, the offspring of Josephine and Crip on 14 February 1974, at Audubon Park certainly did not help the zoo's request for additional cranes. Pepper's cause of death was never firmly established; it was believed to be caused by a bacterial infection, but duck plague virus could not be ruled out (Note l). Following a

second autopsy at the Smithsonian Institution in Washington, D.C., the body of Pepper was sent on to the LSU Museum of Zoology, where it could only be salvaged as a skeleton (Note m).

Following Pepper's death, there were renewed efforts at the Zoo and elsewhere concerning prospects for re-establishing the Louisiana non-migratory Whooping Cranes in their former marshland or some similar setting. There remained at Audubon, now, only George and George I, descendants of Josephine.

Although Crip was unaware in late 1975 that he would shortly meet his fifth mate, the San Antonio Zoo was not. Patuxent and Canadian Wildlife had agreed on the choice of a likely distaff for Crip, recognizing his exceptional value in their propagation efforts and research.

Ektu and Crip

The female that was selected as Crip's mate had been taken from a wild nest designated EK-2, at Wood Buffalo National Park, Canada, on 2 June 1967, and hatched at Patuxent on 11 June. It is interesting to note that this egg, which produced a healthy chick, was taken from a wild nest and artificially incubated for only the last 9 days before hatching, while captive crane eggs are removed almost immediately and placed in incubators, and often fail to hatch or to survive, though fertile. According to Rahn, Ar, and Paganelli research focusing on parent functions during incubation, that is, warming the eggs to the optimal temperature and maintaining the humidity of the nest air, among other factors, must be undertaken to insure critically close duplication of the natural process in artificial incubation.²¹ Therefore, careful study of the behavior and biology of nesting cranes in captivity seems imperative.

EK-2, says Kepler (Note n) was raised alone in an enclosure to avoid imprinting, yet adjacent to others of her species.¹⁶ On 8 October 1968 she was placed with EK-4, EK-1, and Tex, the female offspring of Rosie and Crip who was a little over a year old then. EK-2 formed a pair-bond with the large male EK-4 and together these birds dominated EK-1 and Tex. Following a severe thunderstorm on 4 November, only 27 days after these cranes had been placed together, EK-4 died. Tex was removed from the pen, but EK-1 and EK-2 remained together. Although EK-1 was a male, he remained subordinate to EK-2 for the 7 years they were together. Consequently, they did not mate. Kepler seems to suggest that EK-1 assumed his submissive role following earlier encounters with EK-4 and EK-2, both markedly dominant.¹⁶ In the wild, a subordinate crane has the opportunity to escape (Note f). The interaction between the genetic program and the environment here as elsewhere is open to further investigation.¹ These cranes were separated on 1 August 1975. EK-2 was placed together with another male, whom she attacked almost at once, and, in consequence, had to be removed from the enclosure.

Officials at the San Antonio Zoo, having waited for several years for a suitable mate for Crip, a crane of unusual equanimity, must have received the news of the arrival of the imperious EK-2 with a touch of apprehension. Director Moore of Audubon Park had his concerns, too, at the time, but they were of a decidedly different nature. To set the record straight Moore wrote to Linda Scarbrough, whose article in the New York Times entitled, "The Ugly Duckling Updated" contained a gross inaccuracy. She had failed to state that the first chick ever conceived by two Whooping Cranes in captivity was

hatched by the Audubon Park Zoo in May 1950 (Note o). Although he did not specify that the egg in question was actually hatched at Aransas under Audubon Park auspices, he did imply that the Zoo would probably not receive from Interior sufficient females to continue their breeding program. As it turned out, Moore was correct, the International Crane Foundation was authorized on 21 April 1976, a 2-year loan of a pair of breeding-age Whooping Cranes — a female from Patuxent (Tex) and a male from Audubon Park (George I, later Tony), "for the purpose of propagation and research in artificial insemination techniques" (Note p). The airline that took George I and Moore to Baraboo, listed the bird as George Crane on the passenger list and assigned him a seat in the non-smoking section. Tex, who had arrived on 15 April, and Tony were received at the Foundation with jubilation.²⁸ Since Tex was known to be sexually imprinted upon humans rather than cranes, the pairing of Tex and Tony at the International Crane Foundation was destined to be remarkable.

Two months earlier, EK-2, subsequently called Ektu, arrived at the San Antonio Zoo to be placed with Crip on 11 February 1976. The first meeting was not a blissful one. Experienced Crip must have sensed something different about his fifth mate's behavior because he, uncharacteristically, attacked her right away by giving her several hard thumps on the head while chasing her around the enclosure.¹⁰ Separation was immediate. Several months later, in order to help the cranes finally adjust to one another, the gates between their adjacent enclosures were left open during the day.²⁴ Ektu would wander into Crip's territory and, although he did not touch her, he would run past her at an alarming

pace so that she had no other alternative but to retreat. With time, Ektu and Crip became adjusted to each other and a pair-bond was established. Ektu and Crip were observed dancing and mating in the spring of 1977, but no eggs were laid.

Imprinting

As noted above, Tex had become imprinted on humans rather than cranes. Imprinting begins in birds as they fix on the first moving object encountered after hatching; this principle was established by Konrad Lorenz, and subsequent investigations of imprinting usually follow where he leads. Summarizing his discussion of imprinting, Dewsbury says:

One can demonstrate a complete gamut of phenomena, from a lack of preference for the imprinted object to a life-long atypical mating preference. As with virtually any well-analyzed behavioural phenomenon, the determinants are complex.

To offset the effects of Tex's imprinting on humans and to insure propagation, Archibald undertook a unique experiment at the International Crane Foundation during the spring of 1977.

Some years earlier, the male Can-Us and Tex had been paired at Patuxent. Artificial insemination techniques were employed when Tex did not respond to Can-Us' displays. This procedure, it was hoped, would result in an egg, indisputable evidence of Tex's being a female, in view of the fact that her sex was still uncertain (Note q). This experiment proved negative; however, attention was now directed to the ritual dance, the necessary prelude to mating.

In consequence, Archibald assumed the role of Tex's companion during the mating season. They danced together, she became sexually active, and Tony's semen was ar-

tificially administered to her on 1, 4, and 7 April. Tex laid an egg on 9 April, but it proved infertile. This procedure and related research should contribute to further understanding of Whooping Crane behavior and biology. It is interesting to note that Archibald costumed himself in a red ski cap and white suit for the dance with Tex. Inasmuch as imprinting is generally considered irreversible, one must assume that his role remained essentially human. The costume served, perhaps, as an intermediary between human and crane in Tex's perception. This might lead to consideration of possible step-by-step reversibility of imprinting from humans to cranes, in line with the results of Archibald's role-playing as human-crane.

Only future research can determine whether these procedures reinforced the sexual imprinting on a human, initiated the reversal back to cranes, or confused the preference behavior altogether.²⁶ In their study of filial imprinting on ducks, Hoffman and DePaulo state that an imprinted organism is not doomed permanently. "Nature can in fact repair some of the unfortunate vagaries of environmental experience. Apparently it does so through the continually expanding and adjusting effects of learning".

Walkinshaw recalls the story of a Sandhill crane, originally imprinted on cranes, who became sexually imprinted on one particular man, and for 5 consecutive years laid two infertile eggs on a neighbor's front porch (Note f). Miller, who has done considerable research on imprinting says,

"My thesis is that imprinting is the study of laboratory artifacts and not the study of how animals come to identify conspecifics in nature" (Note r).

Questioning Tony's fertility, the Foundation successfully negotiated the loan of George, renamed Angus,

from the Audubon Park Zoo, in June 1977, on a one-year trial basis. Angus, who arrived in Baraboo in the fall of that year, seemed, by all accounts, to have the temperament and dignity of his sire Crip. He and Tony were to serve as sperm donors to inseminate artificially Tex.²⁹

Crip, in the spring of 1978, could have had the singular distinction of being both father and grandfather at the same time. Ektu laid her first egg on 18 April, at the San Antonio Zoo, while Tex laid an egg on 27 April, at the International Crane Foundation. Alas, neither hatched. Ektu's egg had been fertile, but the embryo died at about 10 days due to bacterial contamination. Tex's chick died during pipping due to an abnormal eye condition.

As with his mother Josephine and, later, his brother Pee Wee, a freak accident contributed to Angus' death. On 24 May 1978, several hot-air balloons flew over the International Crane Foundation site, at Baraboo, Wisconsin, and unwittingly terrified the cranes assembled there. According to Archibald (Note s), Angus flew in panic against the fence and "completely broke off the outer 1½" of his upper mandible." Intensive care was given Angus, but he was unable to eat and had to be force fed. During a forced-feeding session on 16 August, he shifted position and somehow broke the proximal end of his left tibia. All that could be done for this valuable crane was done; however, he never recovered and died on 7 October 1978. The Audubon Park Zoo received the news, as so often in the past, with sadness but with renewed dedication to the cause of *Grus americana* and to the re-establishment of the non-migratory flock in Louisiana.

Epilogue and Conclusions

Artificial light stimulation, egg

removal, and other procedures probably resulted in increased egg production for Crip and Ektu in the spring of 1979. As a result, 8 eggs were laid, the first discovered on the morning of 12 March. Others followed on 14, 18, 21, and 26 March. Before artificial incubation was attempted, each egg remained a short period with the parents. During this time, Crip was observed doing most of the incubation. In fact, he was busy with egg number 5 in the early afternoon of 27 March, when he got up from the egg, walked to the stream at the far end of the enclosure for a sip of water, and suddenly fell over and died. The necropsy report, from Madison, Wisconsin, at the request of the Department of the Interior, attributed Crip's death to a cardiovascular accident.

Ektu laid three more eggs following Crip's death, on 29 March and 2 and 8 April. Five of the eight eggs proved to be fertile. Two of these were shipped to Patuxent and three were retained by the San Antonio Zoo. On 19 April a crane chick was hatched stillborn. However, a week later, at 07:00, on 26 April another chick hatched, was promptly dubbed Criptu, and still survives. This chick is the sole survivor of the 8 eggs laid by Ektu during the spring of 1979.

The uniquely long period of captivity encompassed by the life of the single whooper Crip provided many fruitful opportunities for direct observation over the years and, thus, enhanced accumulated knowledge of an endangered species, hopefully to promote its propagation and survival both in and out of the wild.

Several possible conclusions concerning captive breeding programs involving Whooping Cranes emerge from this biographical study:

1. That male crane fertility may exceed 35 or more years.

2. That crane longevity varies in captivity subject to differing conditions and trauma.

3. That the advantages of nesting over artificial incubation or vice versa cannot yet be determined.

4. That parental care, even in cranes, may involve some learned behaviors.

5. That filial and sexual imprinting are very complex, and possibly subject to variation.

6. That submissive-dominant behaviors of specific cranes may exist apart from sex-role factors.

7. That personal space and optimal enclosure area are important factors in crane management.

8. That the psychological and physiological stress imposed on captive cranes may contribute to poor health and even early death. The suddenness and the nature of Crip's death, perhaps due to overexertion in advanced age, and the earlier deaths of Josephine and Rosie, lead to a persistent question: Do artificial light stimulation, egg removal, and related procedures, which often result in increased production, cause significant stress in the lives of captive cranes, to the extent that such egg production exceeds normal expectations in the wild?

9. That the deaths of Pete and Angus may have been the result of stress arising from different conditions.

Additionally, crane diet, intraindividual and interindividual behavior of cranes in captivity, crane relocation and accompanying stress, and human interactions merit further investigation.

Finally, as a general impression resulting from this biographical study, there is a need to expand current research in captive breeding procedures and programs, to meet present and future objectives.

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WHOOPING CRANE RECORDS FOR MANITOBA, 1943-1979

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On 5 June 1978, Ken Melnick, Manitoba Department of Natural Resources, and I took off in a Cessna 180 from the northern end of Fidler Lake to survey waterfowl breeding on the Churchill River in northern Manitoba. We went south, at an altitude of 30-60 metres and at a speed of 135-160 kph, along the eastern shoreline of the lake just south of where the Churchill River heads east. We observed four Sandhill Cranes standing in a delta-like area of mudflats where a stream entered the lake (57°10'N, 96°54'W). A little further south, we caught sight of a Whooping Crane in flight approximately 15 metres above ground level. The crane passed directly beneath us so identification was easy. The long outstretched neck, the long legs trailing behind the bird, large white wings with black tips and red head patch were all clearly visible. The weather was overcast and viewing conditions were excellent with no glare or reflection from the sun to interfere with observations. We circled to make further observations of the bird and obtain photographs but were unable to find it again. We flew east to where the crane had come from in an attempt to locate other Whooping Cranes but found none.

As we continued our survey along the shoreline at the southern end of Fidler Lake, I was impressed by the similarity between some of the habitat located a short distance inland and habitat portrayed in photographs of Whooping Crane breeding grounds in

Wood Buffalo National Park, N.W.T. Numerous shallow ponds fringed with aquatic emergent vegetation interspersed by low ridges of black spruce, tamarack and willow occurred in the area. This type of habitat is not restricted to the Fidler Lake region but extends in a wide band from Hudson Bay across Manitoba, Saskatchewan and Alberta to the Northwest Territories.

It was exciting enough to witness an observation of a Whooping Crane in this part of Manitoba. However, the sighting was all the more interesting in the light of other reports of the species in northern Manitoba.¹ I decided to attempt to locate other Whooping Crane records in the province, and am grateful to R. W. Nero of the Manitoba Department of Natural Resources and to H. W. R. Copland of the Manitoba Museum of Man and Nature for allowing me access to records in their files. Each record was examined and its authenticity determined on the basis of the amount and conformity of detail contained in the description of the observed bird(s) and presumed credibility of the observer. Those records considered to be authentic were divided into two categories, accepted and confirmed according to criteria used by W. J. D. Stephen, Canadian Wildlife Service, Saskatoon.² Records in these categories are listed in Table 1. Locations of accepted records are plotted in Figure 1.

The major flight path for migrating

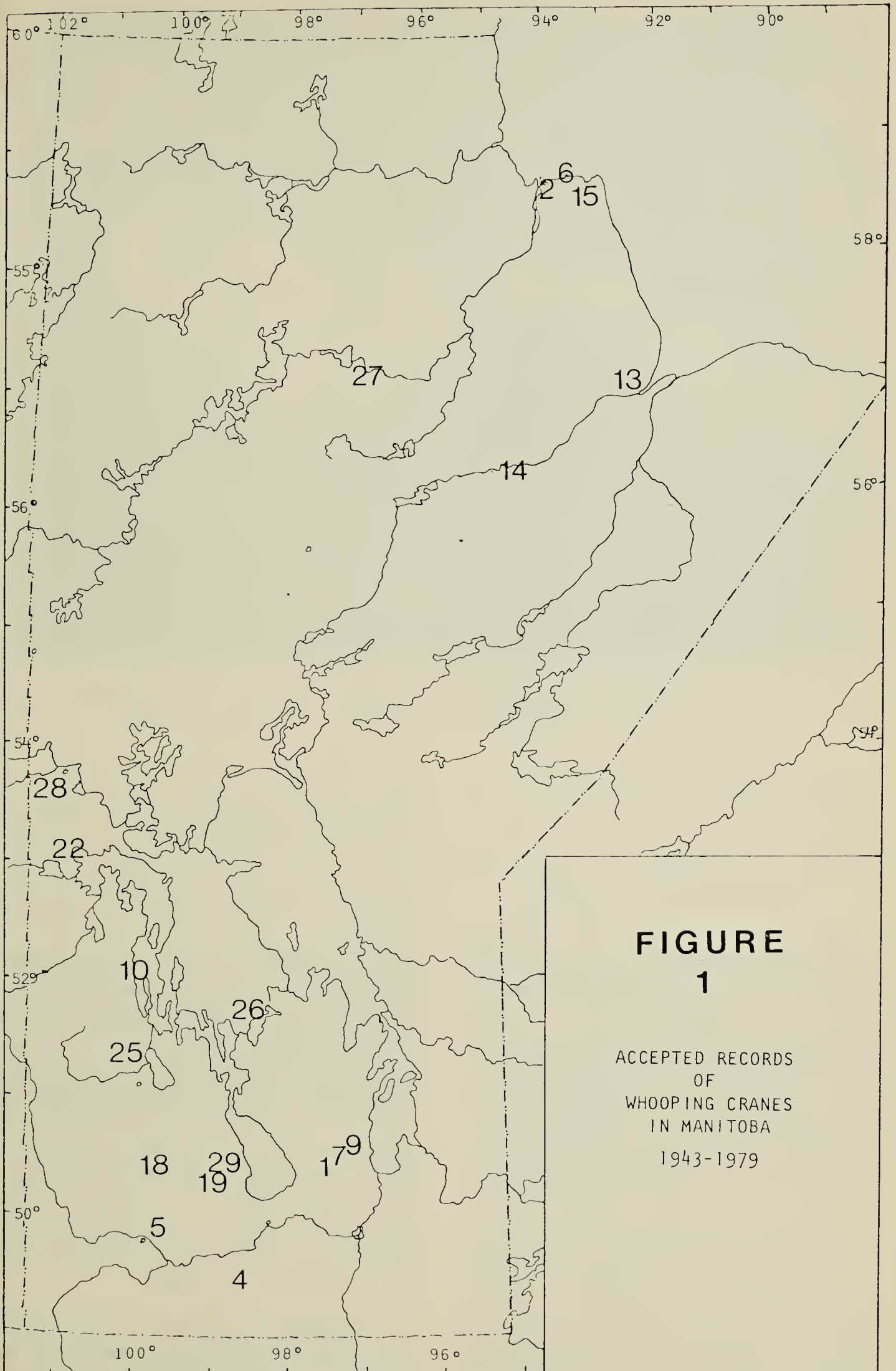


Table 1. Whooping Crane sightings in Manitoba (1943-1979).

Record No.	Date	Location		Legal			No. of Birds	Move-ment	Observer	Type of Obser-vation
				Twp.	Rge.	Mer.				
1	April 26, 1943	East Shoal L.	50°20'N 97°35'W	17	23	W1	9	N	F.C. Ward	A ¹
2	Oct. 1, 1953	Churchill	58°45'N 94°35'W	not applicable			3	-	Mrs. E. Beckett	A
3	April 28, 1955	Russell	50°55'N 101°19'W	22	28	W1	4	-	Mrs. R. Anderson	U ²
4	Oct. 7, 1955	Swan Lake	49°25'N 98°50'W	not applicable			2	S	F.C. Ward	A
5	April 19, 1956	Brandon	49°50'N 100°00'W	10	19	W1	2	N	D.A. Ball	A
6	Sept. 6, 1964	Churchill	58°45'N 94°05'W	not applicable			3	-	I.H. Smith	A
7	April 25, 1971	Teulon	50°18'N 97°26'W	15	1	E1	4	-	R.C.M.P.	A
8	April 29, 1973	Ponemah	50°28'N 96°57'W	17	4	E1	5	E	L. LaRue	U
9	May 17, 1973	Komarno	50°34'N 97°24'W	18	1	E1	2	-	A. Romanyk Mrs. C. Romanyk	A
10	May 8, 1974	Camperville	52°00'N 100°09'W	35	20	W1	4	SW	T.I. Smith	A
11	May 9, 1974	Dauphin Beach	51°08'N 99°50'W	25	17	W1	2	-	D. Juce	U
12	Late May, 1974	Island Lake	53°42'N 94°40'W	not applicable			5	NE	T.A. Hamilton	U
13	June 22, 1974	North Seal Ck.	56°49'N 92°55'W	not applicable			2	-	W.K. Harper I.R. Bukowsky	A
14	Aug. 23, 1974	Gillam	56°15'N 94°35'W	not applicable			4	-	D. Beckett	A
15	April 27, 1975	Churchill	58°46'N 94°00'W	not applicable			2	E	B. Erickson Mrs. D. Erickson	A
16	May 1, 1975	Red Deer Lake	52°55'N 101°27'W	48	28	W1	2	N	B. Hather R. Hather	U
17	Late June, 1975	Pinawa	50°09'N 95°55'W	14	12	E1	4	NE	W. Schwartz	U
18	April 8, 1976	Shoal Lake	50°28'N 100°45'W	17	24	W1	8	NW	C.C. Findlay	A
19	April 17, 1976	Waldersee	50°30'N 98°58'W	18	11	W1	1	-	E. Hoehn	A
20	May 3, 1977	Pointe du Bois	50°13'N 95°34'W	15	14	E1	7	-	R. Knox	U
21	May 8, 1977	Breezy Point	50°14'N 96°50'W	14	5	E1	2	NW	R. Allan	U
22	May 16, 1977	Overflowing R.	53°11'N 101°05'W	48	25	W1	1	-	R.J. Robertson	A
23	May 18, 1977	Gilbert Plains	51°13'N 100°29'W	25	22	W1	4	-	M. Stoughton	U
24	May 22, 1977	Gull Lake	50°24'N 96°31'W	16	7	E1	3	NW	A.R. Kear	U
25	April 11, 1978	Ethelbert	51°23'N 100°08'W	26	18	W1	5	-	M. Dohan	A
26	April 16, 1978	Gypsumville	51°46'N 98°38'W	32	8	W1	2	-	C.J. Ruhr	A
27	June 5, 1978	Fidler Lake	57°10'N 96°54'W	not applicable			1	W	K. Melnick	A
28	May 15, 1979	Pasquia Lake	53°38'N 101°24'W	54	27	W1	1	N	E.F. Whitney	A
29	Sept. 14, 1979	Amaranth	50°36'N 98°44'W	20	12	W1	3	SE	C.W. Collins	U

¹ Accepted record
² Unconfirmed record

Whooping Cranes has been stated as passing through Saskatchewan.³ However, sightings made in the prairie provinces in 1977 and 1978 indicate that this corridor extends to the east and west of Saskatchewan.² Locations of sightings in southern and western Manitoba, illustrated in Figure 1 of this paper, support this observation. The sightings in northeastern Manitoba are particularly interesting since summer locations of all Whooping Cranes are not known. Most yearlings and other sexually immature Whooping Cranes are known to summer in the Northwest Territories portion of Wood Buffalo

National Park.⁴ However, to date, attempts have not been made to identify the summer locations of the entire Whooping Crane population (E. Kuyt, pers. comm.). The presence of habitat apparently suitable for Whooping Cranes in numerous uninhabited regions of northern Manitoba, and the dates of some of the Manitoba sightings (Table 1), leads to the speculation that some cranes may spend a portion of the summer in Manitoba in some years.

If Whooping Cranes are indeed summering in Manitoba, acceptance of sightings will be enhanced if obser-



Adult Whooping Cranes with young, Avonlea, Saskatchewan.

Lorne Scott

uations made are complete. Man's ability to preserve this endangered species and ensure its future existence depends, in part, on the extent of our knowledge of its distribution, movements and habits. The opportunity to contribute to this knowledge is available to us all. I would urge anyone who observes a Whooping Crane to report the sighting to: Mr. E. Kuyt — Canadian Wildlife Service, 100, 9942-108th Street, Edmonton, Alberta, T5K 2J5, (403) 420-2516.

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BOTULISM ON SEVERAL SASKATCHEWAN MARSHES, 1979

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Outbreaks of presumed avian botulism have been reported for several sites in southern Saskatchewan. However, positive diagnosis of botulism has been rare.

Avian botulism is caused by a toxin produced by the bacterium *Clostridium botulinum* type 'C'. This bacteria is a large, gram positive, rod-shaped anaerobe. It is a common soil bacteria which forms highly resistant spores. The toxin, which is extremely potent, is absorbed rapidly in the gastrointestinal system of the victim. Through the lymphatic system the toxin is transferred to the circulatory system where it travels to neurological junctions and interferes with impulse transmissions. The end result is increasing loss of motor control and paralysis.

There are two major theories regarding the methods of dissemination during an outbreak of the disease. The "sludge-bed" hypothesis suggests that a build-up of decomposing animal and plant matter induce anaerobic conditions providing an ideal situation for *C. botulinum* to grow.¹ A suitable pH (7.5-8) and temperature (25°-30°C) are also contributing factors to these conditions.

The "micro-environment" concept suggests the bacteria finds a suitable growing medium in small organic particles such as dead invertebrates.¹ This concept suggests the toxin is ingested in the small

bodies rather than diffused in the water.

Whichever of the thesis is correct is not of major concern if one considers that they can both be caused by the same general environmental conditions.

During the 1979 field season we observed several outbreaks of what was presumed to be avian botulism. This report will describe our observations on some parameters and associated habitat conditions.

Observations

WOOD RIVER DELTA/OLD WIVES LAKE (N.E. 3-14-2 W3)

The Wood River Delta is located at the mouth of Wood River on the west end of Old Wives Lake. A dam and spillway (D.U. Project S 669) hold the water at a higher level and create a large riparian marsh upstream. On the downstream side of the dam a large, variable sized and very diverse marsh has developed. There is a salinity and vegetative gradient as the relatively fresh delta proceeds into the more saline Old Wives Lake.

The shorelines of the delta are very flat and, as summer evaporation lowers the water levels, large mudflats and shallow flooded areas appear. This site has experienced significant die-offs in the past. In 1970 E. M. Wright (former Provincial Biologist) estimated a toll of 24,000 birds primarily Pintail and Mallard.

On 12 August, 1979, Browne and Duffus made an inspection by canoe. On 17 August, we returned to obtain live samples for positive diagnosis of the disease. Due to the condition of the marsh and time constraints we only traversed a small area of the marsh. We saw about 250 to 300 dead and affected birds. During an aerial survey in the same week, we observed no build-up of carcasses which indicates the outbreak may have been limited. We estimated less than 2,000 birds affected at that time.

We removed several specimens for analysis: one adult female Green-winged Teal, one adult female Northern Shoveler, one adult female Pintail, one juvenile Pintail, one juvenile Shoveler, one Marbled Godwit, one American Avocet, one Stilt Sandpiper.

From this sample a mouse protection test, done by the Pathology Department, Western College of Veterinary Medicine, confirmed botulism intoxication as the disease (Dr. F. A. Leighton Final Report M 79-4434).

In addition, approximately 20 ducks in late stages of paralysis were dispatched. These were primarily Green-winged and Blue-winged Teal, Shoveler and Wigeon.

BIGSTICK LAKE EXTENSION (NE. 9-15-25 W3)

The Bigstick Lake Basin is large and saline and, due to low inflow, has not filled since the early 1950's. In 1974, Ducks Unlimited (Canada) built a restriction dam producing a 500-acre marsh on the west end. The conditions during 1979 resulted in the marsh being reduced to 250 acres.

The first report of dead birds came from D. Layton (D.U.). We believe this to be the first outbreak in the

restriction area. On the advice of Dr. W. I. Jensen (Bear River Research Station, Brigham City, Utah) we undertook to collect all the carcasses on the marsh and dispose of them by burning and burying.

During a four-day period with crews of four and five people, we collected all the carcasses by systematic exploration over the whole marsh. Sites were chosen on the nesting islands where trenches were dug for disposal. Using gasoline and diesel fuel, the birds were burned and the trenches filled.

Carcasses destroyed at the Bigstick Lake Extension, 23, 27, 28, and 29 August 1979: Green-winged Teal, 915 birds (44.2%); Blue-winged Teal, 216 (10.4%); Pintail, 189 (9.0%); Wigeon, 101 (4.9%); Shoveler, 90 (4.3%); Gadwall, 85 (4.1%); Mallard, 72 (3.5%); Dabbling Ducks, 1,668 (80.4%); Lesser Scaup, 13 (0.6%); Ruddy Duck, 7 (0.3%); Ring-necked Duck, 3 (0.1%); Redhead, 2 (0.1%); Canvasback, 1 (-); Bufflehead, 1 (-); Diving Ducks, 27 (1.3%); Canada Goose, 3 (0.1%); Coot, 42 (1.7%); Eared Grebe, 14 (0.7%); Sora, 3 (0.1%); Cormorant, 1 (-); Ring-billed and Franklin's Gulls, 13 (0.6%); American Avocet, 4 (0.2%); Lesser Yellowlegs 9 (0.4%); Pectoral Sandpiper, 1 (-); Long-billed Dowitcher, 1 (-); Wilson's Phalarope, 6 (0.3%); Northern Phalarope, 1 (-); Unidentified due to advanced decomposition, 280 (13.5%). Total, 2,071.

About 150 of these birds, alive when captured and deemed unlikely to recover, were dispatched. Unfortunately, no live samples were supplied to the Western College of Veterinary Medicine so we have no positive diagnosis. However, as Rosen pointed out, a presumptive diagnosis is unlikely to be confused with anything except acute lead poisoning and there was no

indication of toxic cyanophytic build-up.³

MIDDLE QUILL LAKE (21-34-16-W2)

Middle Quill Lake is a large, moderately saline basin created by a dam between Big and Little Quill Lakes. The area is an important staging and summer moulting site for the major prairie duck species.

Botulism was suspected during an inspection of the project on 13 August, 1979. Many dead birds were noticed in the outlet area between the structure and the lake proper. On closer examination, several birds symptomatic of waterfowl botulism were noticed. Seven of these were collected for analysis at the Western College of Veterinary Medicine in Saskatoon.

On 16 August, after receiving notification from Dr. Leighton that preliminary diagnosis indicated botulism, a thorough inspection of Middle Quill Lake was made by airboat. The disease appeared to be confined to the outlet area.

Approximately 300 carcasses were collected, burned, buried and covered by lime. Five scarecrows and two scare cannons were also set up in the outbreak area. (Periodic inspection of the site showed the cannons to be mechanically undependable.)

In response to a request by Dr. Leighton for additional information on the outbreak, another inspection was made on 6 September. This examination was intended to obtain an estimate of numbers, and species distribution of birds affected by the disease. A lack of time and manpower (two man-days) made accuracy difficult.

To obtain the requested data a quadrat (60 by 120 m) was

established along an arbitrarily selected portion of the outlet channel. Another (90 by 90 m) was located along the shore near the outlet. Both transects encompassed upland, open water and emergent vegetation. Roughly 80 percent of each was vegetated by *Scirpus paludosis* and some *Scirpus acutus*. The quadrats were searched on foot and an effort was made to comb the entire area; however, dense emergent cover and lack of manpower made accurate counts difficult.

Our findings were: Outlet channel quadrat, 104 ducks; Green-winged Teal, 48%; Blue-winged Teal, 20%; Mallard, 13%; Pintail, 6%; Unidentified, 13%. Lakeshore quadrat, 35 ducks; Green-winged Teal, 13%; Blue-winged Teal, 11%; Mallard, 14%; Pintail, 23%; Wigeon, 3%, Unidentified, 46%. In addition to the above, one Coot, one Sora, and one unidentified Sandpiper were found.

It should be noted that, on previous inspections, Shoveler and Pintail appeared to comprise a larger proportion of the affected birds than did Mallards.

Total ducks affected were estimated by extrapolating the quadrat information to cover the entire lengths of the channel and shoreline (approximately 180 m and 340 m, respectively). About 300 birds had been removed from the area previously, so these were added to the extrapolation.

Total mortality was estimated to be 725 birds. This estimate is undoubtedly conservative; however, it is not likely that the total number of birds lost would exceed 1,000.

Weather conditions, cool and overcast with some rain, relatively high waterlevels until late July, and



Mallard ducks.

Gary W. Seib

possibly the control measures, were instrumental in preventing a much larger mortality on this project.

Discussion

The presence of epizootic outbreaks of avian botulism on

breeding and moulting areas has significant implications. Although waterfowl populations are more dispersed on these areas, many of disease victims are captive subjects. Thus they may not be subject to one of the most inexpensive methods of

disease control, i.e., herding the birds from a particular area. Furthermore, other control methods that have been used on wintering grounds may become uneconomical on breeding areas. Dr. Jensen (pers. comm.) indicated cost per unit using a system of collection, hospitalization and injection was only \$2.00-\$3.00. To use that figure in a breeding/moulting marsh is probably inapplicable due to low concentrations of birds. Simply stated, we could not likely find enough birds in a small enough area to justify intensive care. However, if a die-off the size of the 1970 outbreak at Old Wives Lake occurred, a temporary treatment center could be attempted, if only to provide a cost-benefit analysis.

Under almost any circumstances, especially on Ducks Unlimited projects, habitat manipulation is the most inexpensive disease control method. Most authors feel that altered habitat conditions can be very effective in preventing or stopping an outbreak.^{3 4 2} They suggest the alteration of gradual sloping shorelines, 18-24" depth, permanent Full Supply Land maintenance, late reflooding (colder water temperature), and either flooding or drainage to alleviate the problem. At the Wood River Delta site there are presently no facilities for these types of manipulation. There the only possible control method would be to herd the birds into the lake proper. However, this involves the risk of moving the disease to different areas of the lake shore. At the Bigstick Lake Extension we do have some water level control, except during midsummer. In 1979, due to control gate problems, we received about 8"-12" of water from the Junction Reservoir irrigation system. We also have the option of dewatering the project, an operation

requiring about five days. The major drawback is that there are many flightless birds, some of which would have difficulty finding alternate water areas.

Our observations lead us to believe that the majority of the dead birds were adult moulters. The low numbers of diving ducks is probably attributable to their preference for moulting in deep, open water areas. One might suggest the disease, by the habitat conditions that encourage its occurrence, is somewhat selective. In fact, the published species composition in botulism outbreaks are fairly uniform. Green-winged Teal, Pintail, Shoveler and Mallard are usually among the largest numbers killed.

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WINTERING WATERBIRDS OF WABAMUN LAKE, ALBERTA

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When winter arrives on the Prairies, much of our wildlife escapes either by migrating or by entering a state of dormancy. For those species and individuals that choose to face our harsh winters, life can be difficult; food is buried beneath a blanket of snow or locked under ice just at a time when the cold increases the demand for food and the shorter days reduce the time during which it can be found. The numbers of waterbirds, for example, are limited by the availability of open water.

Before the arrival of white settlers on the Prairies, permanently open water was restricted to rapids or springs. At rapids water is kept open kinetically, while at springs it is kept open thermally because the emerging groundwater is at or above the freezing point. With settlement and subsequent industrialization of the Prairie Provinces, the opportunities for wintering waterbirds have dramatically increased. Most of the opportunities are provided by hydroelectric or thermoelectric power plants. Hydroelectric plants produce open-water kinetically and thermoelectric plants produce it thermally; they are the man-made analogues of rapids and springs.

Thermoelectric plants require large amounts of water to recondense the steam which is used to turn the turbines that produce electricity. Some of the heat from the steam is passed on to the water which is returned to its source where it is replaced by cooler water. If the

power plant is on a river as is the case in Saskatoon or Edmonton, water is discharged downstream and is replaced by upstream water. But if the plant is on a lake (Wascana Lake, Wabamun Lake) the discharged water must be cooled before reuse. This can be accomplished by separating the water intake and outlet so that the water is cooled by mixing with the surrounding water and by contact with the air.

Two of the largest thermoelectric power plants on the Prairies are located near Wabamun Lake, 65 km west of Edmonton, Alberta. These are the Wabamun Steam Electric Plant and the Sundance Steam Electric Plant; both are owned and operated by Calgary Power Limited. The Wabamun Plant (Fig. 1) was established on the north shore of Wabamun Lake, near the town of Wabamun in 1956. This plant uses water taken directly from the lake. The area kept open in the winter varies considerably depending on weather conditions. Under average winter temperatures (approximately -10°C) an area of approximately 140 hectares (stippled area Fig. 1) is kept open. During warmer weather the open water expands to include the area between Point Alison and the intake canal. During a cold spell it contracts to the area between Point Alison and the Pier. The intake and outlet canals are always open.

The Sundance Plant (Fig. 2) formerly used water from Wabamun

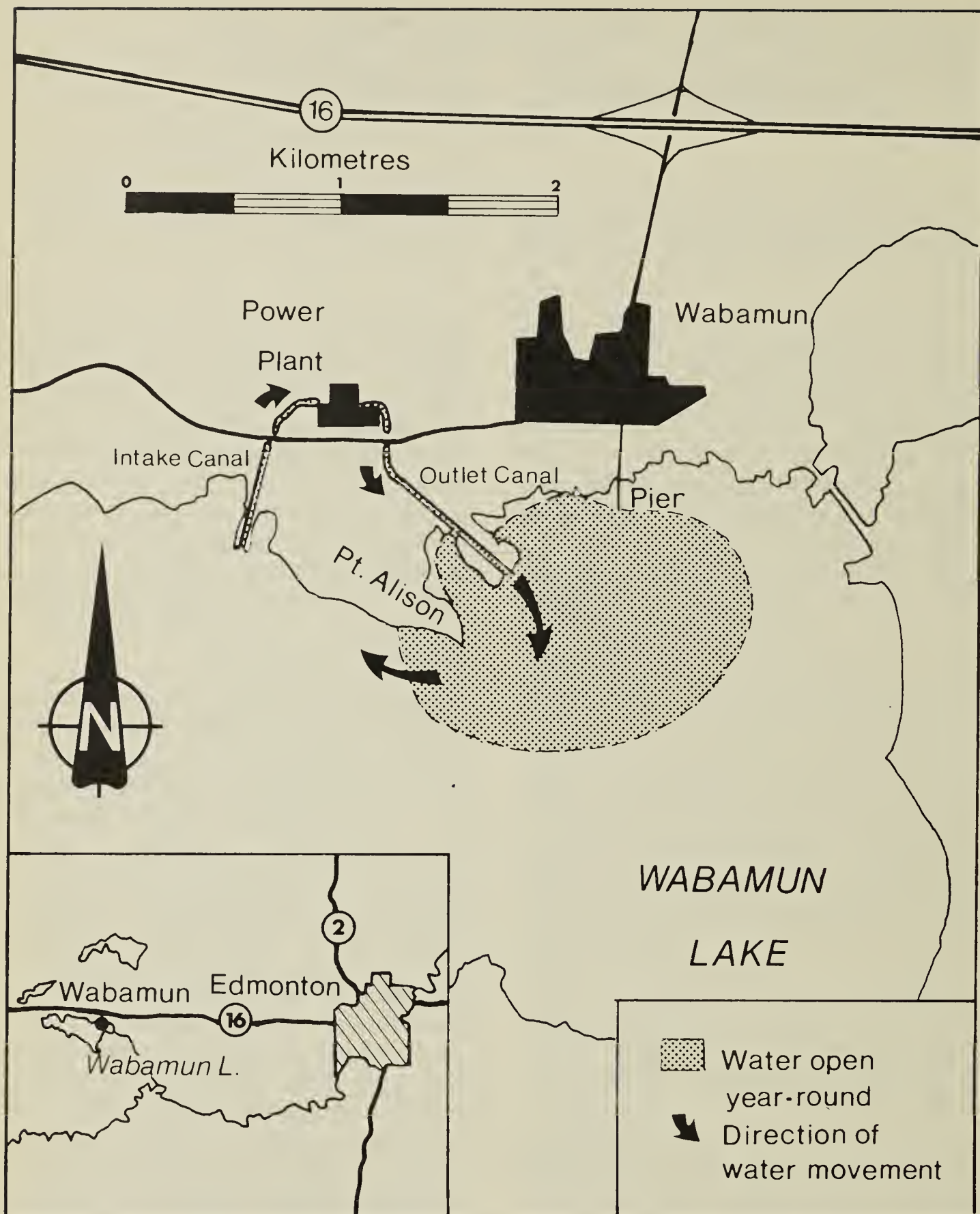


Figure 1: The Wabanum Steam Electric Plant.

Lake as well, but in 1976, six years after its opening, the plant became independent of the lake for its cooling water. In that year a 450-hectare cooling pond was created out of the southern end of Wabamun Lake's

Goosequill Bay and an adjacent boggy area. Water is taken from the northern end of the pond, diverted through the ring canal, used in cooling and returned to the pond via a short outlet canal. A median dike ex-

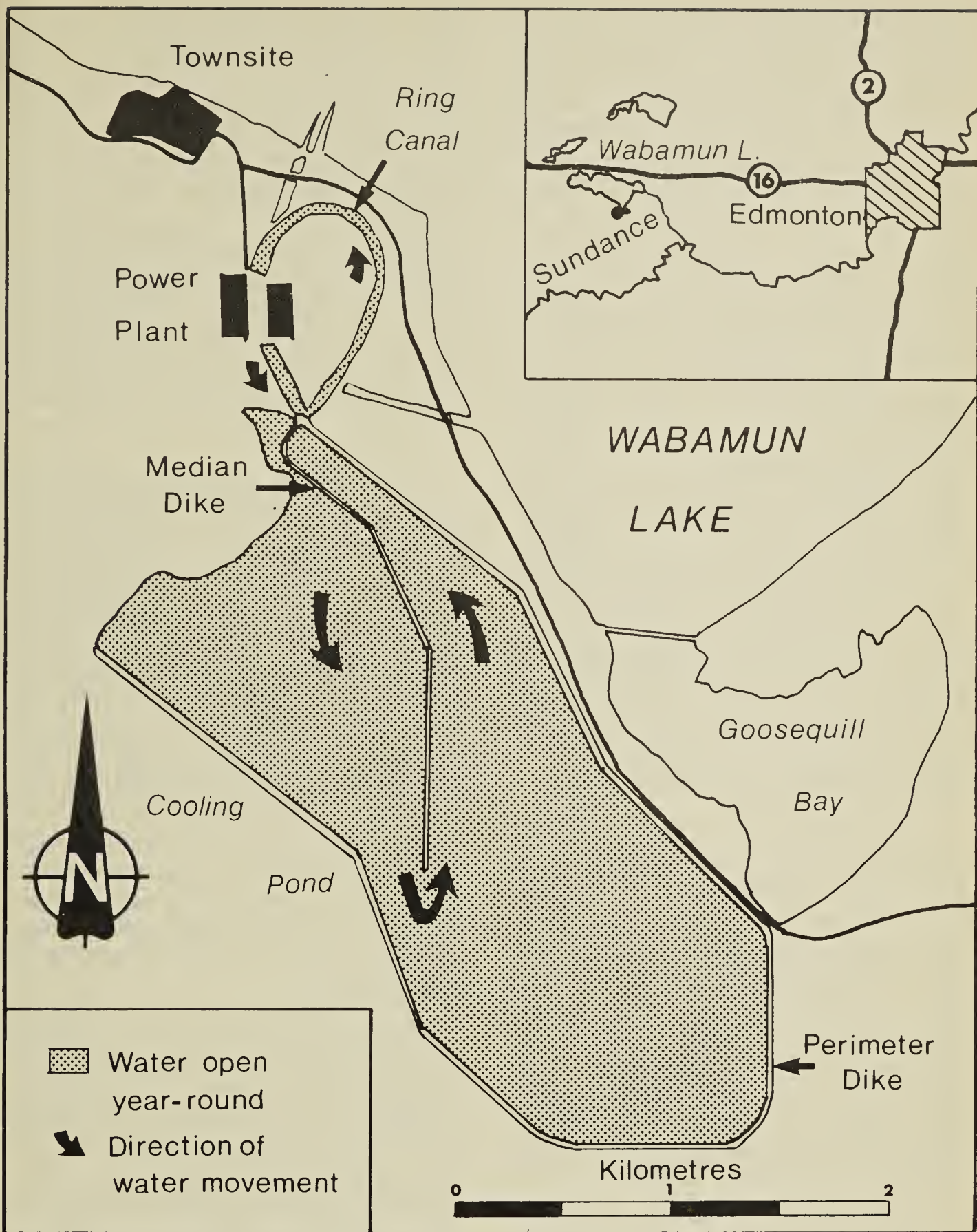


Figure 2: The Sundance Steam Electric Plant.

tends down the middle of the pond to separate the warmer water coming from the plant from the cooler water entering the plant. The cooling pond and ring canal remain entirely open year-round except during extremely

cold weather when the area east of the median dike freezes over.

Each winter the open-water areas created by the Wabamun and Sundance Plants attract a large number and good variety of waterbirds.

Although sporadic observations have been made at these sites since the winter of 1956-57, comprehensive counts did not begin until the winter of 1976-77. Since that time annual counts have been conducted by the Canadian Wildlife Service, International Environmental Consultants and members of the Edmonton Natural History Society.^{2 3 5 6} The results of these counts are presented in Table 1. The period covered is 1 December to 15 March in order to exclude late fall or early spring migrants. During these winters an annual average of 1,184 individuals of 15 species has occurred on the lake while an average of 1,658 individuals of 13 species has occurred on the cooling pond. Almost all of the locally breeding grebes and ducks occurred at either area during at least one winter. The exceptions, the Horned Grebe and White-winged Scoter, occurred on the lake in winters previous to the study (files Alberta Provincial Museum).

The vast majority of the birds were waterfowl — more than 98% at each site. Other waterbirds (including those raptors which were apparently dependent on wintering waterbirds) made up the remainder. Most of the birds were successful in their attempts to winter; individuals observed in early December were usually seen in late February and there were no drastic declines in overall numbers during these winters.

Based on maximum counts, Mallards made up 88% of waterfowl on the cooling pond and 70% on the lake; many more of them used the pond. Of the other regular dabbling ducks, both Gadwall and Wigeon were more common on the lake. Common Goldeneye comprised 10% of the pond's waterfowl and 24% of those on the lake; it was almost twice as abundant on the lake. Among

other regular diving ducks, Lesser Scaup and Bufflehead were also more common on the lake while Redhead and Ruddy were largely restricted to the pond. Except for the American Coot which showed a definite preference for the lake, the numbers of the other species of waterbirds were too small to make an assessment of their preferences. The dissimilarities were probably related to differences in food availability or habitat, or due to different species establishing wintering traditions in each area.

The majority of the Mallards (and hence the majority of wintering waterfowl) were not dependent on the cooling pond and lake for sustenance. Although Mallards used these areas for loafing, roosting and some feeding, the overwintering population was largely dependent on the amount and availability of unharvested and waste grain in the surrounding agricultural areas. This in turn was a function of the weather during the fall and winter.⁴ For example a wet fall may have prevented a complete harvest of grain, while a winter with low snowfall permitted a greater access to unharvested or waste grain.

Except for Mallards and perhaps the few Pintails, the other species of waterbirds were completely dependent on the open-water areas for food. Their numbers however were small and if this is taken into account the total number of birds completely dependent on the open-water areas was small. The average population of waterbirds (excluding Mallards) at Wabamun Lake was 355 individuals (2.5 birds/ha), and at the Cooling Pond it was 206 individuals (0.5 birds/ha). These are minimum estimates of the carrying capacity since these areas were undoubtedly capable of supporting a small but unknown number of Mallards as well.

TABLE 1: Maximum counts of waterbirds and raptors recorded at the Sundance Cooling Pond and Wabamun Lake, 1 December and 15 March, 1976-77 through 1979-80.

	Sundance Cooling Pond					Wabamun Lake				
	1976 -77	1977 -78	1978 -79	1979 -80	Average	1976 -77	1977 -78	1978 -79	1979 -80	Average
Common Loon	—	—	—	—	—	—	—	1	1	0.50
Red-n. Grebe	—	—	—	1	0.25	—	—	1	—	0.25
Horned Grebe	—	1	1 ^a	—	0.50	—	—	—	—	—
West. Grebe	—	—	1	4	1.25	—	—	—	1	0.25
Pied-b. Grebe	—	—	—	—	—	—	—	—	1	0.25
Mallard	2681	142	2145	833	1450.25	1008	550	450	1300	827.00
Gadwall	1	3	—	37	10.25	5	4	15	54	19.50
Pintail	—	—	—	1	0.25	5	1	2	2	2.50
Green-w. Teal	—	—	—	—	—	3	—	—	—	0.75
Blue-w. Teal	—	—	—	—	—	—	1	2	—	0.75
Am. Wigeon	—	—	—	2	0.50	19	35	31	6	22.75
Nrn. Shoveler	—	—	—	2	0.50	1	—	2	—	0.75
Redhead	8	—	6	20	8.50	1	1	—	—	0.50
Ring-n. Duck	2	1	—	2	1.25	—	—	—	7	1.75
Canvasback	3	—	1	1	1.25	1	—	—	—	0.25
Lesser Scaup	6	—	5	1	3.00	15	2	—	10	6.75
Cmn. Goldeneye	191	230	133	82	159.00	400	250	173	285	277.00
Barrow's Goldeneye	—	—	1	—	0.25	—	—	2	1	0.75
Bufflehead	20	2	7	2	7.75	14	5	16	7	10.50
Ruddy Duck	21	—	5	2	7.00	—	—	1	4	1.25
Hood. Merganser	—	—	2	6	2.00	—	—	—	—	—
Cmn. Merganser	—	—	1	—	0.25	2	2	—	—	1.00
Red-breasted Merganser	—	2	—	—	0.50	—	1	—	—	0.25
Red-t. Hawk	1	—	—	—	0.25	—	—	—	—	—
Bald Eagle	1	1	1	2	1.25	3	2	1	2	2.00
Gyr Falcon	—	—	1	—	0.25	—	—	—	1	0.25
Am. Coot	—	—	1	4	1.25	28	8	6	14	14.00
Killdeer	1	—	—	—	0.25	—	—	—	2	0.50
Gull sp.	—	—	—	—	—	1	1 ^b	—	2	1.00
Individuals	2936	382	2311	1002	1657.75	1506	863	703	1700	1193.00
Species	12	8	15	17	13.00	15	14	14	18	15.25
Counts	6	2	4	7	4.75	6	5	5	5	5.25

^aHorned or Eared Grebe.

^bGlaucous Gull.

At present the number of wintering waterbirds on the Prairies is not large on a continental scale. For example, the total wintering population of Mallards in the Prairies, which we estimate to be less than 10,000 in most

years, represents only about 0.1 percent of the total continental population of 10,000,000.¹ The percent is similar for Common Goldeneye (about 1,000 winter on the Prairies out of a continental population of



Canvasback drake.

Fred W. Lahrman

1,000,000¹) but is much lower for all other species. However, if the industrialization of the Prairies continues at the present rate, the numbers of Mallards, Common Goldeneye and other waterbirds remaining throughout the winter could become significant.

We would like to thank Calgary Power Limited for permitting us access to the Sundance Cooling Pond and John Faragher and the Alberta Provincial Museum for allowing us to use their unpublished records.

¹BELROSE, F. C. 1976. Ducks, geese and swans of North America. Stackpole Books, Harrisburg, Pa. 544 pp.

²EBEL, G. R. A. 1979. The Wabamun Lake Christmas Bird Count: 1978. Edmonton Naturalist 7(1):12-15.

³FANNING, M. L. 1978. 1977 Report on the Environmental Management Planning Program for the Sundance Cooling Pond. International Environmental Consultants Ltd., Richmond, B.C. 21 pp.

⁴PRACH, R. W., and D. C. SURRENDI. 1978. Migratory bird management and industrial cooling in northern climates. Can. Water Resour. J. 3(3):111-120.

⁵SMITH, A. R. and G. R. A. EBEL. 1978. The Wabamun Lake Christmas Bird Count: 1977. Edmonton Naturalist 6(2):11-14.

⁶WESELOH, D. V. 1977. The Wabamun Lake Christmas Bird Count: 1976. Edmonton Naturalist 5(2):33-37.

REPRODUCTIVE EFFICIENCY AND SITE ATTACHMENT OF TREE SWALLOWS AND MOUNTAIN BLUEBIRDS

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In March of 1973, 191 bird houses were erected as the initial phase of the Calgary Bluebird Trail. The number of nest boxes was doubled in 1974 to 382, and since 1975, 400 bird houses have been maintained. The trail is approximately 352 kilometers in length with the boxes being about 0.8 kilometers apart. The exact route of the trail is illustrated by Pinel and Robinson.¹⁰

Prior to 1973, personal observations indicated that Mountain Bluebirds maintained a fairly stable population in the badlands along the Red Deer River northeast of Calgary in the vicinity of Drumheller and Brooks, but west of Calgary in the foothills area, fewer Mountain Bluebirds were being seen during the nesting season as the years passed by. Tree swallows, like the bluebirds, were fairly common on migration, but during the nesting season, they were observed uncommonly as local pairs inhabiting the edge of Aspen or mixed White Spruce-Aspen woods in close proximity to a lake or slough in the foothills region. Pairs of Tree Swallows were also noted infrequently in Calgary, always near a nest box. More small acreages began to dot the landscape as the years passed, and with them came more buildings, more cultivation and more Starlings and House Sparrows. These visual assessments, plus the fact that other groups of people throughout the Prairie Provinces were concerned

about the population of Mountain Bluebirds led the author to initiate a trail for the Calgary area.

Table 1 summarizes the reproductive data for the Bluebird Trail from 1973 through 1978. These figures are a compilation of the annual data as recorded by Pinel *et al.*⁹⁻¹⁴ In its first year of operation, 1973, an astonishing 85% of the available nesting boxes were occupied. From 1975 through 1978 with the trail consisting of a constant 400 boxes, the occupancy rate varied only 3.8%. This fact, plus an average 6-year occupancy rate of 92.8%, illustrated a constant high demand for nesting boxes. This is further verified by the 1974 breeding data as compared to 1973. In 1974, the number of bird houses erected was exactly double that erected in 1973 — to see if the number of nests would double. The result was that the number of nests increased 2.2 times from 157 to 353. In two 4-year studies, Chapman lists the occupancy rate varying from 62.5% to 84.5% in Massachusetts, while Houston gives the rate varying from 65% to 98.7% near Saskatoon, Saskatchewan.⁶ The availability of nest sites as a factor limiting the population size of Tree Swallows and Mountain Bluebirds has been documented by Chapman,¹ Erskine,³ Holroyd,⁵ Von Haartman,⁴ and Whittle.¹⁶

Reproductive efficiency is the

TABLE 1 — Reproductive Data, Calgary Bluebird Trail 1973-1978

	1973	1974	1975	1976	1977	1978	TOTALS
Number nest boxes	191	382	400	400	400	400	2,173
Number nest boxes vandalized before nesting	34	42	34	55	43	39	247
Number nest boxes vandalized after nesting	16	4	9	6	15	0	50
Occupancy rate	85.0%	88.5%	97.3%	95.7%	93.5%	96.9%	92.8%
Number Tree Swallow nests	88	242	272	249	165	241	1,257
Number Mt. Bluebird nests	30	54	61	72	104	84	405
Number House Sparrow nests	25	49	110	100	116	65	465
Number House Wren nests	10	8	10	2	4	2	36
Number Black-capped Chickadee nests	1	—	1	—	2	—	4
Number Boreal Chickadee nests	—	—	—	2	—	—	2
Number Red Squirrel nests	—	—	—	—	1	1	2
Number Deer Mouse nests	—	—	7	1	3	4	15
TREE SWALLOW							
Number eggs laid	516	1,399	1,593	1,433	938	1,317	7,196
Number eggs hatched	374	1,194	1,293	1,194	755	1,189	5,999
Number young fledged	293	1,131	1,225	1,115	703	1,176	5,643
Reproductive efficiency (yg. fledged/eggs laid)	56.8%	80.8%	76.9%	77.8%	75.1%	89.3%	78.4%
MOUNTAIN BLUEBIRD							
Number eggs laid	152	302	325	374	534	442	2,129
Number eggs hatched	113	216	231	326	347	414	1,647
Number young fledged	113	214	204	314	323	410	1,578
Reproductive efficiency	74.3%	70.9%	62.8%	84.0%	60.0%	92.8%	74.1%
HOUSE SPARROW*							
Number eggs laid	111	201	463	434	485	287	1,981
Number eggs hatched	40	78	155	135	135	54	597
Number young fledged	0	3	0	9	2	0	14
Reproductive efficiency	0.0%	1.5%	0.0%	2.1%	0.4%	0.0%	0.7%
HOUSE WREN							
Number eggs laid	32+	32	40+	12	22	0	138
Number eggs hatched	26+	29	40+	10	22	0	127
Number young fledged	22+	29	40+	10	21	0	122
Reproductive efficiency	68.8%	90.6%	100.0%	83.3%	95.5%	—	88.4%
BLACK-CAPPED CHICKADEE							
Number eggs laid	7	—	7	—	14	—	28
Number eggs hatched	0	—	3	—	14	—	17
Number young fledged	0	—	0	—	14	—	14
Reproductive efficiency	0.0%	—	0.0%	—	100.0%	—	50.0%
BOREAL CHICKADEE							
Number eggs laid	—	—	—	12	—	—	12
Number eggs hatched	—	—	—	12	—	—	12
Number young fledged	—	—	—	12	—	—	12
Reproductive efficiency	—	—	—	100.0%	—	—	100.0%

*House Sparrow nests, eggs, and young destroyed by author.



Tree Swallow.

Robert J. Long

percentage of eggs producing fledged young. The 6-year mean reproductive efficiency for Tree Swallows and Mountain Bluebirds was 78.4% and 74.1%, respectively. The slight difference in efficiency of the two species over the 6-year period was probably the result of a greater number of second broods by the bluebirds. In a number of cases, a female bluebird would lay a second clutch of eggs, but would desert them before hatching occurred. Other data on reproductive efficiency of Tree Swallows comes from Low who over a 3-year period recorded efficiencies varying from 38% to 58.6%, and Chapman who recorded efficiencies from 51.5% to 84% over a similar 3-year period.^{8 1}

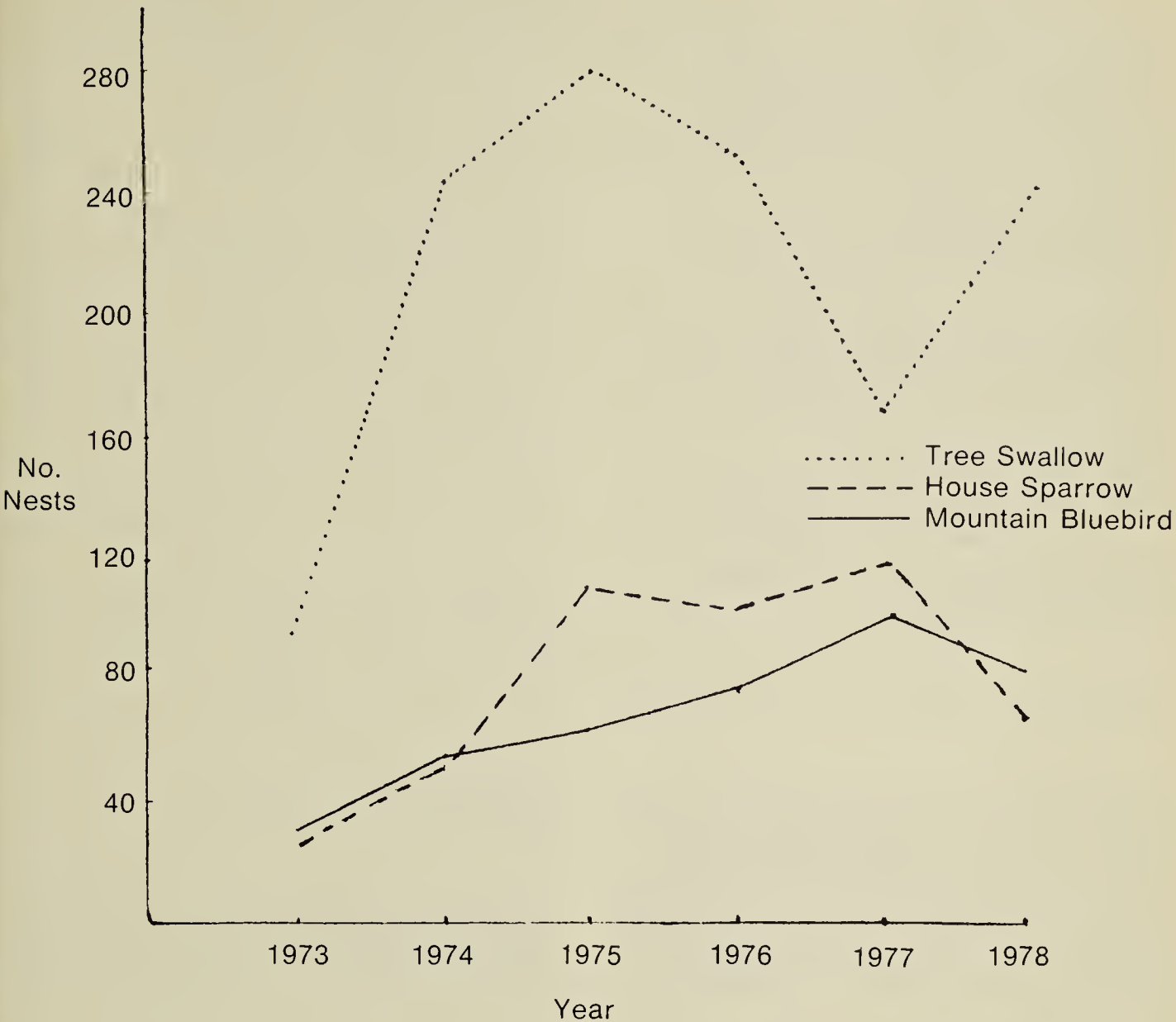
Throughout the length of the trail, the habitat varies from cultivated land to native grassland to Aspen Parkland. Tree Swallows nested anywhere along the trail but Mountain Bluebirds were restricted to Aspen Parkland. House Sparrows preferred to nest in boxes located in areas of cultivated land or in boxes located near human habitation or man-made structures. Because of the melding of the different habitat types, and the apparent non-restrictive habitat needs of Tree Swallows and House Sparrows, inter-specific competition for nest boxes was prevalent. There were 191 occurrences of nesting by different species in the same bird house. Of these 191 occurrences, Tree Swallows were involved in 172 instances, House Sparrows in 104 instances, and Mountain Bluebirds in 87 instances. The two major trends observed in Table 2 were Tree Swallows occupying nesting boxes after House Sparrows and after Mountain Bluebirds. The reasons for both trends are quite different. In the case of the House Sparrows, it was the result of the author destroy-

ing all attempts at nesting by the sparrows, while in the case of the bluebirds, it was the result of the Tree Swallows waiting until the Mountain Bluebirds had reared their family before they commenced nesting. In Figure 1, it can be seen that up to 1975, all three species increased their number of nests due to an increase in nesting boxes, but from 1975 to 1978 when the number of nesting boxes was constant, some species increased, while others decreased.

Tree Swallows and Mountain Bluebirds were banded during 1976 and 1977. In 1976, 609 swallows and 84 bluebirds were banded, and in 1977, 410 swallows and 258 bluebirds were banded. Banding was done as opportunities arose and time permitted. Nestlings were banded from the time that they started to feather. Most of the adults were banded when they were incubating, or when they were feeding young more than 3 or 4 days old. After the young are half grown, it is more difficult to trap the adult birds because the young can reach up to the hole in the box, thereby eliminating the need for the parents to enter it. Table 3 summarizes banding and retrapping data.

The percentage of adult Tree Swallows retrapped was 13.7% as compared to 1.3% for those banded as nestlings. This ratio of approximately 10.5 to 1 adults to nestlings retrapped is even more interesting when you consider that only 197 adults were banded as compared to 822 nestlings. In a 14-year study of this species, Chapman found similar results.² The percentages of adult swallows returning one year after they were banded varied from 7% to 55% and averaged 39.6%. The percentages of banded nestlings returning the next year varied from 0% to 5.0% and averaged 2.4%.

Figure 1. Comparison of the annual number of Mountain Bluebird, Tree Swallow and House Sparrow nests.



Uchida showed a 46% return of adults banded the previous year in his 3-year study of two species of swallows in Japan.¹⁵

The above figures illustrate the tendency of Tree Swallows to return to their natal territory or environs and is termed site attachment or place faithfulness. This attachment to a place is further illustrated by the distances recorded from banding site to recapture site. The 27 adult Tree

Swallows that were recaptured averaged 3.17 km from the point of banding, with 16 of the recaptured adults being within 1.6 km or 2 birdhouses of the place where they were banded. This average of 3.17 km would be considerably less if the longest retrapped distance of 20 km by bird 880-40783 was disregarded due to apparent disturbance by the author. This bird was retrapped twice in 1977. On the first occasion, it was

TABLE 2 — Occurrence of Nesting by Different Species in the Same Nest Box

	1973	1974	1975	1976	1977	1978	Total
House Sparrow then Tree Swallow	5	11	18	12	21	7	74
House Sparrow then Mt. Bluebird	1	—	1	1	1	1	5
House Sparrow then House Wren	1	1	2	1	—	—	5
Tree Swallow then House Sparrow	—	4	3	2	4	—	13
Tree Swallow then Mt. Bluebird	2	1	—	—	—	—	3
Tree Swallow then House Wren	1	3	2	—	3	—	9
Mt. Bluebird then House Sparrow	—	1	3	—	1	—	5
Mt. Bluebird then Tree Swallow	2	4	9	19	27	8	69
Mt. Bluebird then House Wren	2	—	1	—	—	—	3
House Wren then Tree Swallow	—	—	—	—	—	—	0
House Wren then Mt. Bluebird	—	—	—	—	—	—	0
House Wren then House Sparrow	—	—	—	—	—	0	0
Black-capped Chickadee then House Wren	1	—	—	—	—	—	1
Mt. Bluebird then Tree Swallow then Mt. Bluebird	—	—	—	1	1	—	2
House Sparrow then Tree Swallow then House Sparrow	—	—	—	—	2	—	2
TOTALS:	15	25	39	36	60	16	191

nesting only 1.6 km from the box it was banded in, but a month later, it was retrapped 20 km from the original banding place. Two birds banded as adults in 1976 were recaptured in 1979, making them a

minimum of 4 years old.

The 11 nestling Tree Swallows that were recaptured travelled an average distance of 20 km to nest from the

TABLE 3 — Quantitative Summary of Banding Data

	Year Banded	Age	No. Banded	No. Retrapped 1977	No. Retrapped 1978	No. Retrapped 1979
Mountain Bluebird	1976	Adult	11	3	0	0
		Nestling	73	1	0	0
	1977	Adult	42	—	2	1
		Nestling	217	—	0	0
	TOTAL:		342	4	2	1
Tree Swallow	1976	Adult	89	8	3	2
		Nestling	520	3	5	0
	1977	Adult	108	—	11	3
		Nestling	302	—	1	2
	TOTAL:		1,019	11	20	7

box in which they were born. An interesting question is why were there only 11 nestling returns out of 822 nestlings banded. Part of the answer is no doubt higher mortality among young than adults. Perhaps the survivors spread indiscriminately throughout their natural range and only by chance return to their natal area, as suggested by Lincoln.⁷ This theory does not seem to be true as it applies to Tree Swallows. If it was, then how come people with established trails in Hinton and Edmonton, Alberta, and throughout Saskatchewan and Manitoba are not recovering birds banded by me, and vice versa? It was not until Andrew Stiles developed a trail just north of my northeastern section that I started to get returns other than from my trail. On top of this, all the banded birds that showed up in Andrew's boxes were from the northeastern section of my trail. Of the 11 nestling returns, 6 were the result of Andrew's trail with distances travelled by the nestlings of 8.8, 11.2, 16, 17.6, 19.2, and 97.6 km being recorded. There was only one instance of an adult bird (850-98458) moving from my trail to Andrew's trail or vice versa. All this information indicates that the young Tree Swallows coming north on migration to breed return to their natal site, and then radiate out from these to the nearest available nesting sites in response to the pressure and greater territorial dominance of the older birds.)

Although the recovery data for Mountain Bluebirds was much less comprehensive, the same general trend appears to apply. Of the 7 recaptures, 6 were adults recovered an average of 0.4 km from the point of banding, and only one nestling was recaptured, 14.4 km from the nest in which it was banded. (Includes one bird from Dan Sikorski's trail.)

- ¹CHAPMAN, L. B. 1935. Studies of a Tree Swallow colony. *Bird-Banding* 6:45-57.
- ²CHAPMAN, L. B. 1955. Studies of a Tree Swallow colony. *Bird-Banding* 26:45-70.
- ³ERSKINE, A. J. 1964. Nest site competition between Bufflehead, Mountain Bluebird and Tree Swallow. *Canadian Field-Naturalist* 78:202-203.
- ⁴HAARTMAN, L. von. 1957. Adaptation in hole-nesting birds. *Evolution* 11:339-347.
- ⁵HOLROYD, G. L. 1975. Nest site availability as a factor limiting population sizes of swallows. *Canadian Field-Naturalist* 89:60-64.
- ⁶HOUSTON, D. V. 1973. 1972 Best year yet for Saskatoon bluebird house trail. *Blue Jay* 31:35.
- ⁷LINCOLN, F. C. 1934. The operation of homing instinct. *Bird-Banding* 5:149-155.
- ⁸LOW, S. H. 1934. Nest distribution and survival ratio of Tree Swallows. *Bird-Banding* 5:24-30.
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- ¹⁰PINEL, H. W. and C. J. ROBINSON. 1975. Calgary bluebird trail — 1974. *Blue Jay* 33:50-52.
- ¹¹PINEL, H. W. and C. J. ROBINSON. 1976. Calgary bluebird trail — 1975. *Blue Jay* 34:54.
- ¹²PINEL, H. W. 1977. Calgary bluebird trail — 1976. *Blue Jay* 35:43-44.
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- ¹⁵UCHIDA, S. 1932. Studies of swallows by the banding method. *Bird-Banding* 3:1-11.
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CALGARY AREA BLUEBIRD TRAILS — 1979

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The following article gives the results for 1979 of Harold Pinel's Calgary Bluebird Trail, which has been published in *Blue Jay* since 1974. In addition, it adds the results of two recent trails, one of these maintained by Andrew Stiles is now at 165 houses, with 60 in the Priddis area near Calgary, and 105 in the Didsbury area north of Calgary. This trail was started in 1977 when Andrew was 11 years old. The second trail of 100 houses was started by Blake Stillings in the Cochrane area as a retirement project (see map). Harold Pinel's Trail was taken over in 1979 by the Calgary Field Naturalists' Society. It was divided into sections of about 50 houses each and handled by different people. Available manpower did not permit replacing of vandalized houses or covering the complete trail. However, 309 of the 400 houses were covered and the results listed in Table 1.

Our schedule:

1. March or early April — Set up new houses. Cleaned out old houses and sprayed with a 10% creolin solution.
2. May 24 + 1 week. Counted Mountain Bluebird eggs.
3. June 15 + 1 week. Counted and banded bluebird young, and counted Tree Swallow eggs.
4. July 4 + 1 week. Counted and banded Tree Swallow young, and looked for second broods of bluebirds.
5. Early August. Made a last check of the nests to look for infertile eggs,

dead young and late Tree Swallow broods.

These steps were generally followed except for number 5 which was done for only a small portion of the houses.

Table 1 gives this year's results. Andrew Stiles' Priddis trail with 5.76 bluebird young fledged per successful nest is higher than normal. Blake Stillings trail with 5.74 Tree Swallow young fledged per successful nest is at the higher end of the expected range.

One interesting event for the year was a nest with five Tree Swallow eggs and three bluebird eggs. The swallow pair successfully raised this mixed brood. Another interesting event was finding 13 Tree Swallow eggs in one box. There was no nest built and, of course, no eggs hatched.

The habitat where bluebirds are found on the above trails are aspen poplar with grass (parklike) and less than 50% cultivated. This suggests that bluebirds need aspen for shelter, but also need pasture for insects. Open pasture areas with no trees, such as south of Turner Valley, had no bluebirds. Similarly, heavily cultivated areas, such as near Didsbury, have no bluebirds.

The Swallows, on the other hand, are found on all parts of the trails suggesting that they can use a much more varied habitat. House Wrens are found locally where tree growth is thickest. House Sparrows are most



Tree Swallows.

Robert J. Long

often found in boxes within one-half mile of buildings but there is no guarantee they won't occur elsewhere. House Sparrow nests are

always removed when encountered to allow the possibility of bluebirds or swallows taking over.

TABLE 1. Calgary area nest box data — 1979.

	Harold Pinel	Andrew Priddis	Stiles Didsbury	Blake Stillings
Number of boxes	309	60	105	100
Miles of line (approximately)	176	42	57	50
Mountain Bluebirds				
Pairs (nests)	63	23	19	4
% Nests successful*	92	91	68	100
Eggs	322+	137	97	16+
Young fledged	292	121	52	16
Banded	0	13	0	0
Clutch size (eggs)	5.11+	5.96	5.11	Incomplete
Young/successful nest	5.03	5.76	4.00	4.00
Tree Swallows				
Pairs (nests)	187	34	77	79
% Nests successful*	89	88	86	96
Eggs	1,012+	202	435	436+
Young fledged	868+	166	341	436
Banded	41	65	0	0
Clutch size (eggs)	5.41+	5.94	5.65	Incomplete
Young/successful nest	5.23+	5.53	5.17	5.74
House Sparrow nests	35	1	11	3
Wren nests	3	3	3	2
Boxes used more than once	21	6	8	3
Vandalized	21	5	3	8
Boxes not used	21	2	5	4

*With fledged young



Great Blue Heron.

Wayne Lynch

ARTIFICIAL NESTING STRUCTURES FOR GREAT BLUE HERONS

ALLAN P. SANDILANDS, P.O. Box 147, Plattsville, Ontario, N0J 1S0.

Heron use of man-made structures for nesting sites is well documented. Wiese described nesting platforms at Avery Island, Louisiana, that were used by Little Blue Herons, Great Egrets, Snowy Egrets, and Louisiana Herons for over 70 years.^{5 3} Sandilands reported a Green Heron nesting in a Wood Duck box and Gunter recorded Great Blue Herons nesting on duck blinds.^{4 2}

Luther Marsh Wildlife Management Area, located in southwestern Ontario, has supported a Great Blue Heron colony since the 1840-ha impoundment was created in 1952. Boyer and Devitt reported 25-30 Great Blue Heron nests annually from 1955 to 1958 in a drowned white cedar (*Thuja occidentalis*) and elm (*Ulmus* spp.) forest.¹ Nesting habitat for herons continually decreased in this heronry as standing dead timber was removed by spring ice movement or blown into the marsh. In order to maintain a breeding population of Great Blue Herons, the Grand River Conservation Authority constructed multiple and single artificial nesting structures in February 1972.

The multiple-nesting structure consisted of nine unpeeled red pine (*Pinus resinosa*) poles (varying in length from 6 to 10 m) approximately 2 m apart. The poles were connected at four points along their length by 2.5 x 15-cm planks. Poles on the exterior of the structure were braced with steel cable connected to metal fence posts driven into the lake sub-

strate. Thirteen 1.3-m square nesting baskets were placed in the structure, three of them containing nesting material. The sides of the baskets were constructed of 2.5 x 15-cm lumber and the bottom was 2.5-cm mesh galvanized wire strengthened with five 5 x 5-cm strips of lumber.

The four single-nesting structures consisted of a single pole 9-11 m in height with a nesting basket at the top. The poles were braced with four-six poles pushed obliquely into the lake's bottom. Thirty additional single-nesting structures were erected during February 1973 and 33 were located on an island approximately 200 m from the herony in August 1974.

The single-nesting structures on the island and the multiple-nesting structure were failures because the herons avoided them. The single-nesting structures in the lake were partially successful. Great Blue Herons readily adapted to nesting in the single-nesting structures over water, but these structures were unstable due to the physical environment. The substrate of the marsh was deep muck that provided little support in spite of the brace poles and wires. Ice depth frequently exceeded 1 m, so nesting structures were often pulled out when the ice shifted in the spring.

In 1972, all four of the original single-nesting structures were utilized as nesting sites by Great Blue Herons. By the 1973 nesting season, 22 nesting structures were available,



Great Blue Heron.

Larry A. Morgotch

and seven of the 12 nesting pairs of herons used them. Eleven nesting structures were standing in 1974 and held six of the seven nests. In 1975 the remaining seven artificial nesting structures were utilized with no natural sites being selected. This heronry was abandoned in 1976 in favour of another existing Great Blue Heronry in secluded, natural habitat.

The experiments at Luther Marsh demonstrate that, under certain circumstances, Great Blue Herons will adapt to nesting baskets placed on single tall poles. In areas where they can be firmly anchored, artificial nesting structures may become a significant tool in Great Blue Heron management.

¹BOYER, G. F. and O. E. DEVITT. 1961. A significant increase in the birds of Luther Marsh, Ontario, following fresh-water impoundment. *Can. Field-Nat.* 75(4):225-237.

²GUNTER, G. 1956. Duck blinds as nesting sites for Great Blue Herons on the south Texas coast. *Auk* 73(1):131.

³McILHENNY, E. A. 1912. How I made a bird city. *Country Life in America* 22(9):23-28.

⁴SANDILANDS, A. P. 1977. Green Heron nesting in a Wood Duck box. *Auk* 94(2):390.

⁵WIESE, J. H. 1976. Courtship and pair formation in the Great Egret. *Auk* 93(4):709-724.

HOUSE SPARROWS FEEDING ON MALACOSOMA MOTHS

WALTER V. KRIVDA, Box 864, The Pas, Manitoba.

It is well known that birds catch, kill and eat insects. There is, however, very little literature as to particular species being eaten.

I, therefore, found it surprising and instructive to watch House Sparrows flying to and partly alighting on a perpendicular brick wall and taking resting *Malacosoma* Moths (*Malascoma americana*). The moths had swarmed the night before, 20 July 1973, and were on a north wall in the shade. There were perhaps four to six moths per square foot. It was a hot afternoon.

The House Sparrows were making periodic forays out of the 40-foot high Elms in downtown Winnipeg, Manitoba, to the wall. There was an audible sound made by the beak of the sparrow as it hit the brick wall while taking a moth. The birds would return to the trees to eat the moths. This could be seen from time to time the whole afternoon. The wings were discarded as the moth was eaten.

In a few instances a patch of *Malacosoma* eggs could be seen smeared on the wall where the impact of the bird's beak had struck the wall — crushing the moth.

A good study series of many dozen *Malacosoma* was collected on Portage Avenue, Winnipeg. All the specimens are pinned and are in the writer's collection at The Pas. More than one species of *Malacosoma* may be involved here.

In the next few days similar patches of smeared *Malacosoma*

eggs were seen on the walls of buildings in different parts of the city. The *Malacosoma* flight was extensive. This may have been a general and suddenly learned response to an edible species of moth. House Sparrows are recent arrivals here — perhaps 1890.

Different birds evidently learn at different rates as to what insects are edible. These changes have evidently been swift. House Sparrows living in the cities or towns, regularly pick up moths of many species in the early morning that have gathered on shop windows. This essentially is an unnatural accumulation, recently more accentuated by street lamps being changed over to mercury vapor lights. These draw more insects and moths in particular. The number of sparrows has also increased.

I can speak with some authority in that I have been collecting rather intensively for 30 years in The Pas area. A great amount of material is available for study.

The numerical changes that have taken place are rather interesting. In the two decades of the '50s and '60s it was possible to collect about 50 specimens of moths in a summer's morning to, say, 0800 in two town blocks of shop windows. Today, by 0800 one would be lucky to collect 6 to 12 specimens in a half hour of searching and collecting. Birds awake very early and fly from shop window to shop window ledge, picking up a variety of moths. They then kill the moths in the gutters or



Female House Sparrow.

Robert J. Long

cement sidewalks by pecking and then eating them by dismemberment.

In 1961, 1962 and 1963 I noted House Sparrows at Riding Mountain National Park, at Wasagaming, Manitoba, exploring the front grates of parked cars, often loaded with insects, that had just come from a distance.

In early June, various warblers, in their northward migration, would do the same here. They become expert in carefully examining all parts of the car grating. Any insects that flutter to the ground are immediately eaten.

Evidently not all insects are equally relished. Some fishflies and dragonflies caught in the grating were left uneaten.

House Sparrows, resident as they are throughout the year, now exert a considerable pressure on moth populations in city areas. This may reduce moth species and populations in urban areas for reasons other than chemical pollution.

Someone armed with a grant and expertise in collecting and observing should research this problem. It has possibilities of classical dimension.

THE BIRDS AND BIRDERS OF BEAVERHILLS LAKE

ROBERT LISTER, 1979. Edmonton Bird Club, Box 4441, Edmonton, Alberta T6E 4T5. \$9.50. Proceeds to Canadian Nature Federation.

A few years ago, when I was a director of the Edmonton Bird Club, the executive was advised of an unusual problem — a surplus of money. "Operation Spendthrift" was inaugurated, with the club's Honourary President, Robert Lister, being asked to write a book on Beaverhills Lake, a favourite haunt of Edmonton birders. The book has been well worth waiting for!

Much of the text is based on the notes of the late William Rowan, for whom Bob Lister was an assistant for many years. As such, the book is not only a valuable record of the birds at Beaverhills Lake, but also almost a biography of Rowan. In addition, tales are told of many prominent naturalists resident in Alberta or visiting from elsewhere. The last chapter covers some early history of the lake; otherwise the book spans the time from when Bob first saw the lake in 1920, until 1977, when most of the manuscript was complete. About two-thirds of the text is based primarily on experiences with Rowan and his colleagues; the rest on those of members of the Edmonton Bird Club and other recent naturalists, too numerous to name in a brief review. Many of the stories will be remembered by readers fortunate to have spent a few post-Bird Club beer

sessions at Listers! I was very pleased to see these written down both for the enjoyment of others and for the sake of the historical record.

The cover by Dick Dekker, photographs over the years, and drawings by Harry Horton all add to the book. I found few typing errors, and only one which leads to confusion. The date of arrival of Peter Erasmus given as 1885 on p. 250 must be incorrect, as his subsequent activities are described as taking place between 1855 and 1858. Names of birds are sometimes obsolete in the text, but apart from *Acanthis* and *Spinus* appear to be up to date in the checklist at the end of the book. The Ruddy Turnstone is given the incorrect scientific name of *Arenaria virgata* in this list, which omits McCown's Longspur.

The errors listed above are minor and do not detract from the high quality of the book. This publication serves as a wealth of information on birds (and other nature) at Beaverhills Lake over a long period of time, and particularly of changes occurring over the years. Many interesting tid-bits of behaviour and ecology are scattered throughout. My only regret is that there is no species index or people index to help retrieval of the many biological and biographical details recorded.

As a sourcebook of data, the book is valuable, but one need not be interested in technical facts to enjoy reading it. Bob writes with the same humorous style in which he narrates stories, both in relating Rowan's eccentric antics and in telling a joke on himself. I recommend this book

highly to all interested in birds at prairie lakes, to all interested in history of naturalists, and to all who like to be entertained by a good nature book. In his foreword, the Hon. Dr. J. W. Grant MacEwan labels Lister

as "Alberta's undisputed Dean of Bird-watchers." Bob's book does this title due credit. — *Reviewed by* Martin K. McNicholl, 128 Silvergrove Hill N.W., Calgary, Alberta T3B 4Z5.



Common Catail.

Gary W. Seib



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